

ANNUAL REPORT

OF THE

Mass.
=

HARBOR AND LAND COMMISSIONERS,

FOR

THE YEAR 1882.

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Commonwealth of Massachusetts.

HARBOR AND LAND COMMISSIONERS' REPORT.

To the Honorable the Senate and the House of Representatives of the Commonwealth of Massachusetts.

The Board of Harbor and Land Commissioners, in accordance with the provisions of law, respectfully submit their Annual Report for the year 1882.

SOUTH BOSTON FLATS.

Two hundred and forty-four thousand yards of dredged material have been deposited on the flats at South Boston under the contract of August 12, 1881, with the New England Dredging Company, and fifty-seven thousand eight hundred and thirty-one yards under the contract of August 28, 1880, with Thomas Potter. The stipulation of the last-named contract, that the work under it should be completed before January 1, 1883, has not been kept; but the Commonwealth will suffer no detriment from the delay, as the adjoining reclamation will not be hindered, and no special advantage would be derived from the completion of the sixteen acres covered by this contract in advance of that adjoining. A supplementary agreement with the contractor, extending his time one year, has been executed.

About one hundred thousand yards of material dredged by the general government, and by private parties, have been obtained and deposited mostly on the area in rear of that covered by the above-named contracts, making a total of about four hundred and twenty thousand yards of dredged

material, — the largest amount placed upon the flats in any one year since the commencement of the work, and equivalent to nearly twenty acres of complete reclamation.

The amount of material obtained from outside the contracts with the Commonwealth, was much larger than had been anticipated, and proved larger than could be advantageously deposited without provision for lifting it to the grade prescribed for the Commonwealth's own work. The importance of securing this material was obvious, and the necessity of providing for its disposition with the maximum of advantage to the reclamation, and the minimum of disadvantage to navigation outside the area under reclamation, was imperative. Although the contracts already made were estimated to leave no more than a reasonable margin of the existing appropriation for the specific purpose of the reclamation, the character of the work to be done was so plainly that for which the income of the compensation fund could be used, that there seemed to the Board no question but that the entire appropriations available were adequate for all the work that need be undertaken.

A contract was accordingly made, on the first day of July, with the New England Dredging Company, to provide for receiving all the material that should be deposited from miscellaneous sources, raising the same, and placing it on the area in rear of that covered by its previous contract, leaving it, at grade thirteen, uniform with the other filling of dredged material. In connection with this measure, and as part of the inducement for adopting it, the Board effected an arrangement with riparian proprietors, who would be accommodated by confining the immediate operations of the Commonwealth to a smaller area than would otherwise be practicable, by which the Commonwealth will receive for the use of its unoccupied flats outside the area of present reclamation, one thousand dollars per year for three years. Copies of these several contracts will be found in the appendix.

B Street has been covered with gravel, as provided in the contract reported last year, and is now completed, so far as the Commonwealth is required to construct it, to Congress Street.

Negotiations have been re-opened for the purchase of the

larger of the outstanding fractional interests in the area of riparian ownership, which the Commonwealth had undertaken to obtain under chap. 446 of the Acts of 1869, and the Board are hopeful of a successful conclusion at an early day.

As the work involved in the South Boston reclamation proceeds, its success as an advantageous development of the great property of the State, and as a scheme of harbor improvement and utilization, seems more fully assured. Already its prosecution has added fifty acres to the deep-water area of the harbor, and a series of docks and piers that may be justly the pride of any harbor, while the frontage remaining for development is adequate for the accommodation of indefinite growth.

Mistakes in treatment of the reclaimed area may thwart the full commercial advantage to the community which might be secured by adhering to well-considered and comprehensive plans, and may greatly reduce the amount to be realized to the treasury; but no mistakes that have been made, or that are likely to occur, can probably prevent the Commonwealth's enterprise from proving a signal benefit to its commercial centre, and bringing a large contribution to its treasury.

CLAIMS AGAINST THE BOSTON & ALBANY R.R. CO.

The claims of the Commonwealth against the Boston & Albany Railroad Company, were put in suit under the provisions of chap. 50 of the Resolves of 1880. Negotiations for settlement, pursuant to chap. 58 of the Resolves of 1881, have been in progress since the passage of the latter resolve, and have resulted in a settlement for the sum of \$100,000, upon the terms stated in the agreement printed in the appendix. A determination, in the courts, of all the controverted questions involved in these claims, could only be effected by litigation indefinitely prolonged. It was obviously desirable that a settlement should be effected, if any reasonable concessions could bring the parties together. The position of the Commonwealth, in relation to the amounts directly accruing under the terms of the several contracts, had been so liberally and temperately stated by the Board in earlier negotiations, that the present Board found little

remaining, beyond minor corrections of areas and amounts, resulting from modifications of lines, that could, with due regard to the rights of the Commonwealth, be conceded.

The balance actually due to the Commonwealth under the contracts, exclusive of claims for interest and damages, was \$66,929.32. The claim for damages by reason of delay in the prosecution of the stipulated reclamation of the flats sold, seemed to us, as to our predecessors, to be a valid one; but, upon careful consideration, in the light of the instructions of the proper legal adviser of the Board, the amount likely to be recovered seemed exceedingly problematical. It was evident that large consequential damages, fairly assumed to have resulted from such delay, would be excluded by the rules of law applicable to such liability, and that what would remain would be of vague and uncertain amount, and not likely to be large. By practically waiving this indefinite claim, the settlement reached has been effected. While the Board are conscious that the concessions made have been liberal, they believe the true interests of the Commonwealth have been secured by the action taken.

BACK BAY LANDS.

		FEET.
In 1857 the Commonwealth owned on the Back Bay,	.	4,723,998
	FEET.	
Of which there have been donated,	363,308.00	
Devoted to streets and passage-ways,	2,037,068.60	
Sold as per last report,	2,221,027.80	
Sold in 1882,	14,425.60	
	<u>2,235,453.40</u>	
Remaining for sale Dec. 31, 1882,	88,168.00	
	<u>4,723,998</u>	
The gross proceeds of land sold as per last report,	\$1,706,636 77	
The gross proceeds of land sold in 1882,	48,602 40	
	<u>\$1,755,239 17</u>	
Rights in Parker Street sold as per last report,	2,300 00	
	<u>\$1,757,539 17</u>	
Cost of filling, grading, etc., as per last report,	\$1,626,008 71	
Cost of auction sales as per last report,	14,291 78	
	<u>1,640,300 49</u>	
Net proceeds to Dec. 31, 1882,	\$3,117,238 68	

There have been sold in 1882 as follows : —

6,025.60 feet Marlborough Street, north side,		
for	\$25,502 40	
8,400 feet Newbury Street, south side, .	23,100 00	
	<hr/>	\$48,602 40

The average price per foot obtained in 1882 was \$3.3691, the lowest price \$2.75, and the highest price \$4.50.

The sales have been much less than in 1881; but there has been no decrease in prices, and the amount of land remaining unsold is so small that no apprehension is felt but that as good prices will be obtained for all that remains.

The land unsold is located as follows : —

Marlborough Street, north side,	10,752 ft.
Commonwealth Avenue, south side,	3,237
Newbury Street, north side,	12,320
Newbury Street, south side,	17,808
Boylston Street, north side,	36,176
Boylston Street, south side,	7,875
	<hr/>
	88,168 ft.

The value of the remaining land cannot be less than \$200,000.

TIDE LANDS.

The amount received during the past year for the occupation of the land of the Commonwealth, under the licenses of the Board authorizing wharf and other structures in tide-water, is \$11,733.15. The total amount received and paid into the State treasury since the passage of the law directing these assessments to be made, is \$140,469.10.

RESURVEY OF BOSTON INNER HARBOR.

During the past field season, the resurvey of the Inner Harbor, commenced in 1878, has been resumed, and some progress made, both in triangulation and topography, in extending it beyond the point of former limitation, at the pier of the East Boston elevator, to Jeffries Point, and still eastward to the Boston, Revere Beach & Lynn Railroad embankments. The scale of this work is the same as that adopted for the series of original maps, viz., $\frac{1}{10000}$.

MISCELLANEOUS SURVEYS.

The field surveys of the Board have involved more than

the average amount of yearly work. Besides the special surveys of Charles River, and of Salt Pond in Falmouth, described in detail elsewhere in this report, the work of the Board has been substantially as follows :

In connection with the South Boston Flats reclamation, accurate surveys have been made, with calculations and estimates of areas and quantities, upon which the determination of the amount of work done by the contractors has been based. These surveys and determinations have been made each month as the work progressed. In connection with the same work, hydrographic surveys have been made in the main harbor basin, and in Fort Point Channel, for testing the areas and depths of the ground dredged.

A complete hydrographic survey has been made, on a scale uniform with the harbor resurvey ($\frac{1}{1000}$), of Fort Point Channel from its mouth to Federal Street bridge. This shows the improved condition of the channel effected by the special dredging operations which have been done mainly during the year, and also affords a basis for projecting further contemplated improvements.

The improvements already made in Fort Point Channel, below Congress Street bridge, consist in excavations by the Boston Wharf Company of about 20,000 cubic yards, over an area of about 30,000 square feet, making an average depth of about 19 feet at mean low water. On the part of the Commonwealth, the Board has excavated about 50,000 cubic yards, over an area of about 150,000 square feet, making a depth of 15 feet at mean low water. Above Congress Street bridge, the Standard Sugar Refinery Company has made excavations, in straightening and deepening the channel to 13 feet at mean low water, from Congress Street bridge to its wharf.

PHYSICAL SURVEY OF CHARLES RIVER.

During the past year, the Board has been applied to by some of the railroad companies whose bridges cross the channel of Charles River, for leave to occupy the water-spaces between some of these bridges, from the harbor line on the Boston side of the river out to the line of the present drawway openings, with pile structures similar in construc-

tion to the present bridges; and thus to acquire additional yard-room for multiplying switches, for better access to depots, and for other railroad uses.

While recognizing the importance of ample terminal facilities to successful railroad management, the Board could not but regard the appropriation of the deep natural channels of the harbor to such purposes, as a very serious matter, — particularly in connection with other projects, the success of which must, more or less, depend upon the peculiar treatment of the river; such as the plans of the Cambridge Improvement Company for providing better commercial frontage on the Cambridge side of the river, between Craigie and West Boston bridges; the improvement of the upper basin, contemplated in the scheme of the Park Commissioners; and the important enterprise in connection with ocean navigation, already undertaken by the Hoosac Tunnel Dock and Elevator Company, and requiring all the physical accessories and natural advantages possible. The proposition of the railroad companies is apparently not in harmony with the best development of these last-named projects, which are more truly in the line of harbor improvement.

The location and character of the numerous bridges which encumber the mouth and throat of Charles River, have always been considered as objectionable, and every well-devised scheme of harbor improvement has pointed to the correction of these injurious structures, as a *sine qua non* to the restoration of this channel to its fullest physical and commercial capabilities. So familiar are the facts and arguments bearing upon this subject, that it is unnecessary to repeat them here. With the largest latitude in favor of artificial methods of improvement, the peculiar configuration of Boston Harbor, with its succession of straits and basins, gives peculiar value to its natural tidal forces. The constantly recurring change of ten feet in the ocean level, and the power of its influences, are elements of security on the one hand, and of danger on the other, which no proper consideration of the conservation of the harbor can ignore.

It seemed to the Board that the possible or probable effects of the proposed changes in the bridges and pier lines of Charles River, involved the apparently conflicting interests

of commerce, by land on the one hand, and by water on the other, to such an extent that the petition of the railroad companies ought not to be granted, or refused, except upon the fullest knowledge of all the data which might aid in the right solution of the problem. There had been no physical survey of the Charles River for more than twenty years. The Board deemed it necessary, therefore, to make a re-examination and survey of this part of the harbor, in order to ascertain, if possible, by its results, how, and how much, if any, the water-space of the Charles River may be encroached upon by solid or pile structures, without injury to the present facilities of navigation. The peculiar configuration of Boston Harbor, as before remarked, and the pressure of the large tide into its arms and reservoirs, make it manifest that these facilities may be impaired by reducing the width and depth of channels; by augmenting the rush of water through the bridge-draws, which are the only means of access to the upper basins; or by producing unequal scour, and thereby creating excessive excavations in one place and obstructive shoaling in another.

One of the questions that has continually presented itself during the past twenty years, is this: Do piles, driven in rows across a channel, cause excavations between them, and, if so, is the material, thus excavated, deposited above or below the piling, to the injury of the channel, or to the injury of the discharge section, or to the deflection of the current? An important inducement to the proposed survey, was the obtaining of light on this and similar questions, by a comparison of the results of a new survey with those of the physical survey made in 1861, by Prof. Henry Mitchell of the Coast Survey, also one of the members of the United States Commission and Advisory Council for Boston Harbor. In ordering the work of the present survey, the Board has received most valuable counsel and advice from Prof. Mitchell as to the methods and details of the work, in order that the observations made might coincide in character and location with those of the former survey, thus making the results a true indication of the changes which have taken place. The present survey has been executed with the greatest care and accuracy, and every practicable means

adopted to insure the best physical results. We quote largely from the sub-report of our engineers in giving the items and particulars which it is most desirable to state. The Map appended to this report is also especially to be referred to, as exhibiting in a very full and satisfactory manner the results in detail.

The survey was made during August, September, and October, 1882. The area surveyed comprises that part of Charles River lying between its mouth, at the point of the United States Navy Yard, where it joins the waters of the Mystic River, and the West Boston bridge, where a natural bar separates the lower basin from the one above. The hydrographic survey was based upon the topographical survey of the upper harbor, made in 1878, and such changes in the lines of wharves and bridges as have taken place since that date, have been resurveyed. The same scale was adopted for the appended hydrographical map, as that of the topographical harbor survey, above referred to, viz., $\frac{1}{10000}$, which allows the greater part of the soundings taken to be plotted. The number of soundings taken was 12,815, and the position of each sounding has been accurately determined by instrumental observation and other approved methods. The soundings are referred to the plane of mean low tide (or 5.4 feet), on the standard tide-staff of the Coast Survey at the United States Navy Yard, equal to 14.7 feet below the coping of the dry dock.

Observations for slope of river were made simultaneously at fourteen different stations. Tide-staves were placed and referred to the standard tide-staff at the Navy Yard, at each of these stations, as follows: one above West Boston bridge; three above Craigie bridge; one below Craigie bridge; three below Lowell R. R. freight bridge; three above Lowell and Eastern R. R. bridge, and three below Charles River bridge. A whole tide, from one low-water through high-water to the following low-water, was observed on a tide of mean rise and fall. The results of these observations have been tabulated, and transverse curves of surface, at the several bridges, have been plotted. All observations have been tabulated and reduced to mean range of tide, equal to 9.8

feet, and plotted in plan and profile. From the transverse curves for each bridge, the curves of greatest velocity give the velocities which are represented by arrows on the plan. These arrows, therefore, show simultaneous velocities and corresponding directions, over the whole area observed, of the swiftest current on a tide of mean rise and fall.

Under Charles River bridge were found the remains of three old bridge piers of crib-work and stone, one of them being dry at low tide, and the other two in 26 feet of water. The piles supporting the bridges were counted and located on the map, and the direction of the bays in relation to the current indicated. The number of piles, as counted in the respective bridges, between the embankment walls, and between the harbor lines, is given in the following table :—

NAME OF BRIDGE.	NUMBER OF PILES.	
	Between embankment walls.	Between harbor lines.
Charles River and adjoining wharves,	2,030	1,000
Warren,	1,820	1,120
Fitchburg R. R.,	8,420	2,700
Boston & Maine R. R.,	4,400	3,200
Eastern and Lowell R. R.,	4,870	4,340
Lowell R. R. freight,	2,617	2,267
Craigie,	1,700	1,645
Total,	25,657	16,272

The gross amount in area of piling, between the pier lines on either side of Charles River, of the group of bridges from Charles River to West Boston bridge, inclusive, is about *forty-one acres*.

The maximum slope is shown to occur between the Lowell and Eastern R. R. bridge and Charles River bridge, where, in a length of 1,700 feet, a fall of 0.7 feet was observed on the maximum strength of the tide, equal to a degree of slope of 2 17 feet per mile.

It is noticeable that the greatest velocity maintains itself very nearly during two current hours (the fourth and fifth), both on the ebb and the flood tides.

The deepest place in the channel is directly above the Lowell and Eastern R. R. bridge, which has 30.6 feet at mean low water. From this point upward, the 23-foot channel trends towards the Cambridge shore, ending about 900 feet above Craigie bridge, and then gradually decreasing in depth to 10.2 feet over the “bar” at West Boston bridge. The navigable channel through the several draws has the following depths at mean low water and at mean high water:—

DEPTHS OF CHANNEL AT DRAWS.	At M. L. W. FEET.	At M. H. W. FEET.
At Charles River bridge draw,	26.0	35.8
Warren bridge draw,	14.3	24.1
Fitchburg R R bridge draw,	22.7	32.5
Boston & Maine R. R. bridge draw,	21.2	31.0
Lowell and Eastern R. R. bridge draw,	18.5	28.3
Lowell R. R. freight bridge draw,	26.2	36.0
Craigie bridge draw,	24.3	34.1
West Boston bridge draw,	8.2	18.0

A comparison of the results of the two surveys of 1861 and of 1882, shows the changes which have taken place during the time involved (21 years); and the following table gives the amount, in quantities and depths, of these changes in the bed of the river in the various sections of the area examined and compared.

Table showing changes that have occurred in Charles River between 1861 and 1882.

No. of Section.	LOCALITY.	SHOALING.		DEEPENING.		EXCESS OF SHOALING.		Average height of shoaling in feet.	Greatest shoaling in channel in feet.
		In cubic yards.	Over area in acres.	In cubic yards.	Over area in acres.	In cubic yards.	Over area in acres.		
1	From West Boston bridge to Craigie bridge, . . .	150,704	55.3	65,296*	25.5	85,408	80.8	0 65	4.7
2	Craigie bridge to Lowell freight bridge, . . .	48,704	7.4	37	-	48,667	7.5	4 04	5.4
3	Lowell freight bridge to Lowell and Eastern bridge,	173,233	24.6	-	-	173,233	24.6	4.37	7.7
4	Lowell and Eastern bridge to Boston & Maine bridge,	55,085	10.4	-	-	55,085	10.4	3.30	5.2
5	Boston & Maine bridge to Fitchburg bridge, . . .	73,559	14.6	-	-	73,559	14.6	3.12	4.8
6	Fitchburg bridge to Warren bridge, . . .	43,181	6.5	463	0.3	42,718	6.8	3.87	4.8
7	Warren bridge to Charles River bridge, . . .	70,544	12.8	207	0.6	70,337	13.4	3.24	5.8
8	Charles River bridge to mouth of river, . . .	165,359	45.5	3,741	2.7	161,618	48.2	2.08	3.8
Whole basin from West Boston bridge to mouth of river,		780,369	177.1	69,744	29.2	710,625	206.3	2 13	7.7

* Partly artificial, by dredging.

The deepening which has occurred is mainly confined to the basin above Craigie bridge, where the Boston side of the channel has been scoured deeper, and the Cambridge side has shoaled; the excess of shoaling being 85,408 cubic yards, over an area of about 80 acres. In the general channel the shoaling is greater than on the flats on either side of it. In one place in the channel, above the Lowell and Eastern railroad bridge, the shoaling is 7.7 feet. The greatest average shoaling, 4.37 feet, is in the basin between the Lowell and Eastern and the Lowell freight bridges, where the river meets the greatest number of pile obstructions.

The amount of shoaling found to have taken place in the bed of the channel, is a surprise to most of those who have speculated upon the probabilities, and is greater than Prof. Mitchell expected to find it. It would be logical to suppose that the piling, by narrowing up the section, would increase the velocity between the piles, and create a scouring force that might undermine the bridge structures. A comparison of the results of the two surveys proves a reverse action.

Our engineers submit the following conclusions :—

“ That the shoaling is due to obstructions caused by the piles is not to be doubted. They act as so many gratings through which the water has to be filtered, creating an artificial slope without the corresponding velocity; for, to a slope of 0.7 feet in 1,700 feet, or 2.17 feet of slope per mile, would belong a corresponding velocity of 8.9 feet per second, or *five and three-tenths miles per hour*, in the narrowest section if *unobstructed*; whereas, we find, by observation, a velocity of only *sixty-five hundredths of one mile*. With a *free section*, a slope of 0.0098, or *three hundredths of one foot per mile*, would be sufficient to produce the velocity observed.

“ The surplus ‘head’ created by the pile obstructions, is evidently used up in destroying the *vis viva* of the water, stopping its momentum, and allowing the sediment carried in it to drop and be deposited upon the bottom. It is therefore to be concluded that, so long as the pile structures remain in their present order and condition, the shoaling will continue in the same ratio as is found to exist between 1861 and 1882.

“ Another effect of the piling is to distort the tidal wave, increasing the axial delay, and extending the maximum velocity over a greater space of time, thereby preventing the proper reinforcement of the Mystic River tides by those of the Charles River and its basins.”

We have thus presented to our consideration an apparently paradoxical phenomenon. We find the river water piled up to an unnatural head, but without a corresponding movement to equalize its level; and, instead of increased velocity through the drawways, tending to cause excavation and to undermine the bridges, we find the water toiling slowly through the almost impenetrable forest of piles. The drawway openings, which might be expected to give some relief, are found to be inadequate to that purpose, and probably too narrow in proportion to the width of the river; and the water-spaces between the bridges allow the slope created within each drawway opening to diffuse itself, laterally, in each recurring water-space between the bridges, so that, instead of a continuous flow, particularly through the alignment of draws from the Lowell Railroad passenger bridge to the Warren bridge, the water forces its way by a succession of abrupt falls as it passes through each bridge, and then loses its headway.

We also find a large reduction in the depth of channel, and a markedly injurious effect upon the discharge section. It may be said that the shoaling which has taken place has not yet reached a point injurious to navigation. But it must be borne in mind that the work of shoaling going on is in the very deepest portion of the harbor, and, although it may take time to do practical injury, the action in that direction is steadily progressing. There are unknown elements, particularly in the phenomena of tidal action, the results of which it is difficult to predict. There are instances where the same class of forces as those at work here, viz., a tendency to shoal on the one hand, and an opposing force tending to maintain a channel-way on the other, have remained in equilibrium until some perhaps trifling predominance of shoaling power has so suddenly increased that action, that harbors and inlets have been destroyed in short spaces of time.

It is not practicable to discuss at length, in this report, the technical questions involved in the case before us. The manuscript map of the survey, with all the data of the observations, are in the archives of the Board for reference and examination. The reduced copy of the manuscript map

appended to the report, gives a better illustration of the main features of the river than can be conveyed in a written description. By examining this map, it will be seen how the obstruction of the river will be aggravated by the proposed encroachments.

The filling of the water-spaces between the bridges, from the present pier line on the Boston side out to the line of the drawway openings, virtually extends the Boston frontage to the draw line ; for, although the occupation of but one water-space is at present asked for (that between the Boston & Maine and the Eastern railroad bridges), if it be granted, there is no logic in refusing to allow the spaces between the other bridges to be similarly occupied.

The Board, therefore, is met by the grave and important question, whether it is wise and safe, notwithstanding the terminal advantages accruing to the railroads from the scheme proposed, to advance the pier line into the middle of the channel of Charles River. To do so would clearly be not only to violate all the traditions and teachings of scientific research, and to thwart the beneficial purpose and result of the establishment of harbor lines, but, as already intimated, possibly, and even probably, to conflict with or defeat other schemes of harbor conservation and improvement.

By examining the appended map, it will be seen that the 23-foot channel, at the very point where the encroachments are proposed, is entirely on the southerly side of the railroad draws, and between them and the Boston pier line. Filling the water-space in question will obstruct the whole of the 23-foot channel, even to the summit of the abrupt bank on its northern side, and fill the entire channel section with a dense pile structure.

We would also call attention to the peculiar formation and trend of the northerly bank of this 23-foot channel in its course from the Lowell Railroad freight bridge to the Warren bridge. No borings have been made to ascertain the character of the material of this bank, so to call it, but it gives evidence, by resisting the current forces from the upper basins, and deflecting them so markedly, of being firm and hard, and may be of antecedent formation. It is not the less impor-

tant to regard its influence in defining and maintaining the channel where it now is.

Whatever may be said, also, of the effect of the pile structures, they have hitherto exerted a uniform influence by their uniform position across the whole section of the stream. The question, therefore, naturally arises, What will be the consequences to the channel and the harbor if pile obstructions are increased one hundred per centum in one half of the river-bed, while the other half is left unchanged?

In view of the facts presented, and after careful consideration of the interests and dangers involved, the Board does not feel justified in authorizing the further occupation of the water-spaces in the manner proposed.

MERRIMAC RIVER.

In accordance with chap. 23 of the Resolves of 1881, the Board made an examination, and submitted a statement in its last annual report, of the condition of the draws in the bridges crossing the Merrimac River below Haverhill, with a view to the improvement of the navigation of the river. Very satisfactory work has been done during the past year in carrying out the recommendations of the Board. By the courtesy of Mr. Charles A. Putnam, of Salem, the engineer who has had charge of the work in question, the Board is able to report the following particulars.

In consequence of defects in one of the spans of the Groveland bridge, the county commissioners determined to rebuild the entire superstructure, and, in place of the old style of leaf-draw, to remove one of the old draw-piers, and build a new circular stone pier for a pivot-draw, with a wooden fender pier. This work was done by Messrs. Ross & Parker, and a wrought-iron riveted bridge structure, built by the Boston Bridge Company, was erected, — the entire work costing about \$73,000.

The work on the Deer Island bridge, in Salisbury, is now progressing rapidly, and will probably be finished in March. The stone work of the piers and abutments, and the timber work of the draw-piers, and the removal of the present old bridge, which is to remain until the new bridge is open for

travel, were awarded to, and are being done by Messrs. Ross, Greely & Blaisdell. The bridge proper is a wrought-iron riveted structure, built by the Boston Bridge Company. The new draw is a circular pivot-draw, with clear openings on either side of the central pier of 56 feet at the low-water line. The length of the bridge between abutments is $397\frac{1}{2}$ feet. The cost of the work is \$92,000.

The proposed work at Rocks Bridge, between Haverhill and West Newbury, will include the removal of the present draw and the first main span south of it, and also of the present southerly pier of the old draw, and the building in place thereof of a new circular stone pier and a stone side pier. The drawway openings on either side of the central pier will be 56 feet in the clear at the low-water line. The entire length of this new structure will be about 219 feet. The stone work, dredging and timber work have been awarded to Mr. Joseph Ross, and the bridge, which is to be a wrought-iron riveted structure, to the Boston Bridge Company. The entire cost of the work will be about \$41,000.

The Eastern Railroad Company has completed the new timber fender draw-pier at its bridge at Newburyport, the entire cost being about \$10,000.

These bridge improvements will greatly facilitate the navigation of the Merrimac. Through the wise foresight of Mayor Howe of Haverhill, a careful study of the frontage of that city upon the river has also been made, and, at his instance, a careful survey and plan prepared, as the basis for the alignment of future wharf structures.

The work done in this river by the general government, has been in charge of General George Thom, U. S. Engineers, and the appropriation of \$9,000, made August 2, 1882, has been expended in improving the channel by dredging, and removing dangerous sunken rocks at the Lower Falls above Haverhill, and at Rocks Bridge below that city. The ledge near the outlet of Newburyport harbor, known as South Badger ledge, has also been broken up and removed to a depth of $9\frac{1}{2}$ feet at mean low water.

ARTIFICIAL HARBORS.

Salt Pond in Falmouth.

A petition was presented to the Board by citizens of the town of Falmouth, mainly those residing near the seashore south of the main village, for authority to open the beach, and to make an artificial channel connecting the waters of the Vineyard Sound with those of Salt Pond, in Falmouth, with a view to making the latter a harbor of refuge such as the depth and area of the pond might afford.

The proposed undertaking involved the probabilities of the success of an interesting and useful project, with results not only of local but of general value, inasmuch as the pond in question, by reason of its proximity and relations to the beach and ocean waters beyond, was a type of others along the shores of the Commonwealth, the improvement and utilization of which would be a public benefit.

The Board had not sufficient data on which to base an intelligent judgment regarding the feasibility of this project. It was deemed expedient, therefore, to make a survey of Salt Pond, and of its surroundings and physical relations to the outside waters of the Sound, in order to ascertain how far the project of making it an artificial harbor might be practicable.

The result of such tidal observations as it was practicable to make, determined the surface of the pond, in its present state, to be somewhat above the mean high-water plane of the Sound; and the tidal volume, through the present small and imperfect inlet, to be so inconsiderable as to affect but slightly the rise and fall of the water in the pond.

An opening through the beach, of sufficient depth and width to answer the purposes of a navigable channel, would, of course, change the regimen of the pond, so that the full rise and fall of the tides without would be maintained within it. This tidal action would have two physical effects; one, to create possible scour and disturbance of the bottom, particularly through the excavated channel, and where it debouches upon the Sound; and the other, to change the character of the margin of the pond from its present uniform condition to a "strand," with exposed flats between the high and low water lines.

Owing to the purity of the water of the Sound, and the sandy nature of the shore of the pond, there seems to be no cause for apprehending unpleasant or injurious effects from any changes which might occur.

It is more difficult to predict the consequences of the tidal currents through the proposed opening; but the only important question, in this connection, is their probable effect upon the permanency of the opening. To maintain an opening, it would undoubtedly be necessary to secure the sides of the excavated channel.

The outside protection to the opening is a matter of still greater importance, and more uncertainty. The Board is not possessed of sufficient data to enable it to prescribe advisedly in regard to it. The small stone pier and dock, near the site of the proposed opening, have withstood the wave and current action upon this shore for about sixty years, with but slight, if any, change in the entrance or depth of water inside the dock. But this structure has not created the tidal disturbance, nor produced the local current, likely to occur in the tidal inflow and outflow of Salt Pond. With the slight rise and fall of the tides, and the small reservoir capacity of the pond, the currents might not have sufficient power to injuriously affect the opening. The element of greatest danger and most uncertainty would be the sea-dash upon the shore. What effect this might have, and how violent it might be, cannot be determined without further observation.

Considering all the conditions and contingencies involved, the Board feels justified in recommending the project as a feasible one.

With regard to the utility of such a work, it can certainly be classed as a valuable coast improvement. It would create a harbor of refuge upon an exposed shore; and, although the entrance would be limited, the shelter within would be secure. The depth of water contemplated and practicable, — six or eight feet at mean low tide, — would admit vessels of considerable size and in considerable numbers; and the project, if successful, would have an importance beyond its local utility, by suggesting similar works in other localities, where the results might be of equal and even greater value.

The area of the pond, in its present natural state, is 61.4 acres ; its anchorage area, inside the line of six feet depth at mean low water, would be 24.3 acres ; and, inside the line of eight feet depth, 20 acres.

A map of the pond and beach, showing in detail the results of the survey made by the engineers of the Board, is on file in this office for reference and examination.

BOUNDARY LINES BETWEEN CITIES AND TOWNS BORDERING UPON THE SEA.

The Board has continued, during the last year, the work devolved upon it by chap. 196 of the Acts of 1881, of locating and defining the boundary lines between cities and towns bordering upon the sea, from high-water mark outward to the line of the Commonwealth.

The preliminary step of locating and defining the line which bounds the territorial limits of the Commonwealth, extending "one marine league from its seashore at low-water mark," had been taken the preceding year ; and the line of the Commonwealth, so established, was fully described, by metes, courses and bounds, in the last annual report. In extending the boundary lines of cities and towns out to this exterior line of the Commonwealth, it has been found necessary for the Board, or its engineers, to visit the points where the lines of land division, already established between the several cities and towns, terminate upon the shore ; and a description and sketch of the monument or bound by which each of these points is marked, has been taken. Most of the localities where the terminal point is at the mouth of a river or inlet, have also been examined.

During the summer, the Board appointed meetings with the mayor and aldermen of the city of New Bedford, and with the selectmen of the towns of Westport, Dartmouth, Fairhaven, Mattapoisett, Marion, Wareham, Falmouth, Gosnold, Gay Head, Chilmark, Tisbury, Edgartown and Nantucket, respectively, and held conferences with them in regard to their several boundary lines ; and is under obligation to these gentlemen for valuable information and assistance.

So far as practicable, the Board has endeavored to adopt

and carry out a uniform system in locating the division lines of water jurisdiction, based upon mathematical principles, and upon geographical and physical conditions ; and has thus been able to avoid, in great measure, the necessity of deciding controverted facts, and the pressure of local feeling and interest. In most cases, the departure or bearing of the boundary line has been governed by the trend of the adjacent shores, or the relation of the adjacent headlands. Where the line has passed through bays, coves, sounds, channels or straits, as in the case of the general dividing line between the respective towns on either side of Buzzard's Bay, Vineyard Sound, Muskeget Channel, Wood's Holl and Cohasset Narrows, the rule has been to determine the central point in each successive water-space by measurements from a number of headlands or points, surrounding or adjacent to such water-space, sufficient to mathematically determine its position, and then to run the boundary line from one such central point to another throughout the course of the general line. A line so located and defined can be mathematically reproduced by referring to the same plans of the United States Coast Survey which the Board has made its basis of projection, and of which a copy is to be filed in the office of the Secretary of the Commonwealth, and in the Registry of Deeds of the county in which the line is situated, and also in the office of the Harbor and Land Commissioners ; or by reference to any other accurately executed map, or by direct bearings and measurements from the points and headlands indicated on the plans of the Board.

But few questions of disputed municipal jurisdiction have arisen in the determination of the lines thus far located. In the case of the boundary line between Edgartown and Nantucket, the question arose as to how far the jurisdiction over Muskeget and Gravel Islands, claimed by Edgartown, might affect the jurisdiction over the waters adjacent to these islands and to the respective towns. After careful consideration, and in view of the peculiar geographical relations of the respective territories, and as the more equitable solution of the question, the ruling of the Board has been, that the boundary line of water between the towns of Edgar-

town and Nantucket, should run through the main Muskeget Channel, and should be located and defined by means of, and upon the basis of, measurements of the same character from the headlands of Edgartown on the west side of the Channel, and from those of Nantucket on the east side; and that the jurisdiction of Edgartown over the land of Muskeget and Gravel Islands should not affect the jurisdiction of Nantucket over the waters surrounding them.

In the case of the boundary line between the city of New Bedford and the town of Fairhaven, the southerly end of this line is established, by chap. 130 of the Acts of 1811, at the "mouth of Acushnet River." After conference with the representatives of the respective municipalities, and in accordance with the construction adopted and acted upon by them during a long series of years, the "mouth of Acushnet River" was interpreted to mean the water-space between Fort Point on the easterly or Fairhaven side, and the opposite shore of Clark's Point on the westerly or New Bedford side. The system already described was followed in determining the precise central point within this water-space, from which to extend the boundary line of water between the city and town in question, to the general division line of Buzzard's Bay.

In like manner, the boundary line between the towns of Marion and Wareham was located and defined at the central point in the mouth of the Weweantic River, and extended from this point to the general division line of Buzzard's Bay. The same method was applied in other cases.

The boundary line which was the occasion of the most controversy, and where the claims contested were of the largest value and importance, was that between the towns of Wareham and Sandwich. It would be impracticable to discuss at length in this report the points at issue. As in the case of Edgartown and Nantucket, the difficulty arose from the existence of islands lying within the water area to be apportioned between the towns, — it being controverted, first, to which town the islands belonged, and, that question being settled, second, how far the islands should control or modify the division of the water area. Hearings were had at Buzzard's Bay, and at the office of the Board, and counsel

heard in behalf of each town. Upon first consideration, the Board located what was, to a certain extent, a compromise line; and, in anticipation of the full completion of its work, gave to each town a sketch illustrating such proposed location. It is understood that the location so indicated is not wholly satisfactory to either town, and is not likely to be accepted as a final settlement of the boundary question. Under these circumstances, upon further deliberation, and after a fuller study of this and other similar cases, the Board has felt obliged to reconsider its first action, and to adopt a different method of division, which is, in its judgment, the best and most equitable solution of the difficulties involved in this class of cases.

The method referred to is that already stated in general terms, namely: that when the water area to be divided lies *between* two towns, it is to be apportioned to the towns by a line drawn through its middle or central points; that the position of these points is to be determined by measurements outward from the shores and headlands of the *mainlands* of the respective towns; and that *islands* lying within this water area, and of inconsiderable size as compared with the whole territorial area of the towns, are to be disregarded in locating the line of water division, both in respect of their geographical position and of the municipality to which they belong.

In other words, the Board is charged with the duty of an equitable division of the tide-water areas of the Commonwealth between the several cities and towns, for purposes of municipal jurisdiction, and for the enjoyment of the rights and privileges which result therefrom. The Board has no power to change the limits of their land jurisdiction. It leaves these as it finds them. But there is no apparent reason why one town may not have jurisdiction over an island surrounded wholly or in part by waters which are within the jurisdiction of another town. To hold that the land area of a town extends, for purposes of water division, to the furthest point of its remotest island, would require, in some cases, the apportionment to such town, at the expense of another town, of hundreds or thousands of acres of water for each acre of island. The only equitable or practicable rule in

such cases, is to draw the line of water division where it fairly belongs, taking all the other elements into account, and leave the islands to drop where they may.

Between the towns of Provincetown and Truro some complications existed, owing to the accretion of land upon the East Harbor shore, and the consequent encroachment of the land upon what was water when the original terminal point of boundary was established. The action of the Board has been to extend the boundary line as nearly in conformity as possible to the original water-spaces, and to connect it with a newly located terminal point at the present shore line.

Beginning at the southerly extremity of the coast line of the Commonwealth, the Board was met by the difficulty that the first line in order, the westerly line of Westport, was not only a town line, but also the boundary line between the waters of the States of Massachusetts and Rhode Island, which the Board had no authority to establish. It seemed important, therefore, before proceeding with the boundary lines between the towns, to provisionally locate and define a line of boundary between the waters of the States, leaving its legal establishment to the legislative action of the States respectively. In order that no misunderstanding or conflicting action might occur, the Board submitted a description of its location of the inter-state line to the Board of Harbor Commissioners of Rhode Island, who not only fully concurred in what this Board had done, but took measures to secure the legislative sanction of the latter State; and an act was passed by the Senate of Rhode Island "To establish the boundary line between the waters of the State of Massachusetts and the State of Rhode Island and Providence Plantations." This act was pending before the House when it adjourned, so that it requires further action to become a Rhode Island law. A draft of an act for concurrent legislation on the part of Massachusetts, which is respectfully submitted to the consideration of the legislature, is appended to this report.

The Board does not understand that the act directing it to locate and define the lines of water boundary, requires it to report in detail to the legislature as a part of the legal

action necessary to establish them. But, as this work has occupied a considerable part of its attention, and is of interest to the seaboard municipalities, the Board submits the foregoing statement, and the following description of lines already located, for the information of the legislature and the public :

*Boundary Line between Rhode Island and Massachusetts,
and between Little Compton and Westport.*

The boundary line between the waters of the State of Rhode Island and Providence Plantations and the State of Massachusetts, which is also the boundary line between the waters of the town of Little Compton in the former, and the town of Westport in the latter State, is located and defined as follows: Beginning at the south-western corner of the territorial limits of the Commonwealth of Massachusetts, at a point in latitude $41^{\circ} 25' 5''$, longitude $71^{\circ} 5' 28''$, and distant one marine league from the shore line, which is a line from the headland at Warren's Point in Rhode Island to the headland at Gooseberry Neck in Massachusetts; and thence running northerly to the point on the shore at the southerly end of the State boundary line between Rhode Island and Massachusetts, as heretofore established by law.

Boundary Line between Westport and Dartmouth.

The boundary line between the waters of the towns of Westport and Dartmouth is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running south $34^{\circ} 30'$ east to the line of the Commonwealth.

Boundary Line between Dartmouth and New Bedford.

The boundary line between the waters of the town of Dartmouth and the city of New Bedford is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running south-easterly to a central point, marked 1 on plan, at the mouth of Clark's Cove; thence still south-easterly to a point, marked 2 on plan, in a line drawn from Dumpling Rocks to

Sconticut Neck, and one-third of the distance of the length of said line measuring from Dumpling Rocks; thence south more easterly to a point, marked 3 on plan, in the general division line between the towns on either side of Buzzard's Bay, as said general division line has been located and defined, and is shown on plan.

Boundary Line between New Bedford and Fairhaven.

The boundary line between the waters of the city of New Bedford and the town of Fairhaven is located and defined as follows: Beginning at the end of the boundary line as heretofore established at a central point, marked 1 on plan, in the mouth of Acushnet River, and running south-easterly to a central point, marked 2 on plan, in the head waters of New Bedford harbor; thence south-east more southerly to a point, marked 3 on plan, in a line drawn from Dumpling Rocks to Sconticut Neck, and one-third of the distance of the length of said line from Sconticut Neck; thence south-east more easterly to a point, marked 4 on plan, in the general division line of Buzzard's Bay, as hereinbefore described.

Boundary Line between Fairhaven and Mattapoisett.

The boundary line between the waters of the towns of Fairhaven and Mattapoisett is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running south-easterly to a central point, marked 1 on plan, in the head waters of the cove between Sconticut and Mattapoisett necks; thence south more easterly to a central point, marked 2 on plan, in the mouth of the cove above named; thence east more southerly to a point, marked 3 on plan, in the general division line of Buzzard's Bay, as hereinbefore described.

Boundary Line between Mattapoisett and Marion.

The boundary line between the waters of the towns of Mattapoisett and Marion is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running south-easterly to a central point, marked 1 on plan, in the mouth of Aucoot

Cove; thence east more southerly to a point, marked 2 on plan, in the general division line of Buzzard's Bay, as hereinbefore described.

Boundary Line between Marion and Wareham.

The boundary line between the waters of the towns of Marion and Wareham is located and defined as follows: Beginning at the end of the boundary line as heretofore established at the junction of the Sippican and Weweantic rivers, and running south-easterly, following the central line of the said Weweantic River, to a central point, marked 1 on plan, in the mouth of the said Weweantic River; thence easterly to a central point, marked 2 on plan, in the inner part of the water-space at the common mouth of the said Weweantic and the Wareham rivers; thence south-easterly to a central point, marked 3 on plan, in the outer part of the water-space aforesaid; thence east more southerly to a central point, marked VIII on plan, in the water-space at the head of Buzzard's Bay, which central point is also the north-easterly end of the general division line of Buzzard's Bay, as hereinbefore described.

Boundary Line between Wareham and Sandwich.

The boundary line between the waters of the towns of Wareham and Sandwich is located and defined as follows: Beginning at the end of the boundary line as heretofore established, at a central point, marked 1 on plan, in the mouth of Red Brook, and running south-easterly to a central point, marked 2 on plan, in the south-westerly corner of Buttermilk Bay; thence southerly, south-easterly, and south-westerly, following the central line of Cohasset Narrows, to a central point, marked 3 on plan, in the first enlarged water-space below said Narrows; thence southerly to a central point, marked 4 on plan, in the next succeeding water-space; thence south-westerly to a central point, marked 5 on plan, in the next succeeding water-space; thence south-easterly to a central point, marked 6 on plan, in the next succeeding water-space; thence south-westerly to a point, marked 7 on plan, midway between the headlands on either side the water-space; thence still south-westerly to a central point,

marked 8 on plan, in the next succeeding water-space; thence south-easterly to a central point, marked 9 on plan, in the next succeeding water-space; thence southerly to a central point, marked 10 on plan, in the next succeeding water-space; thence still southerly to a central point, marked 11 on plan, in the next succeeding water-space; thence south-westerly to a central point, marked 12 on plan, in the next succeeding water-space; thence still south-westerly to a central point, marked VIII on plan, in the next succeeding water-space, which is the water-space at the head of Buzzard's Bay, said central point being also the easterly end of the general division line of Buzzard's Bay, as hereinbefore described.

Boundary Line between Sandwich and Falmouth.

The boundary line between the waters of the towns of Sandwich and Falmouth is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north $88^{\circ} 40'$ west, to the general division line of Buzzard's Bay, as hereinbefore described.

Boundary Line between Falmouth and Gosnold.

The boundary line between the waters of the towns of Falmouth and Gosnold is located and defined as follows: Beginning at a point equally distant, southerly, about seven-twelfths of a mile, from each of the headlands forming the southerly entrance to Wood's Holl, as shown on a sub-plan, being the United States Coast Survey harbor chart of Wood's Holl, which point is marked 1 on said sub-plan, and running south $28^{\circ} 30'$ east, to the general division line between the towns on either side of Vineyard Sound, as said general division line has been located and defined, and is shown on plan. Again, beginning at the first named point, marked 1 on sub-plan, and running north-westerly to a central point, marked 2 on sub-plan, in the southerly mouth of the passageway of Wood's Holl; thence still north-westerly to a central point, marked 3 on sub-plan, in the mouth of Great Harbor; thence westerly to a central point, marked 4 on sub-plan, in the passageway aforesaid; thence still

westerly to a central point in said passageway, marked 5 on sub-plan; thence north-westerly to a central point in said passageway, marked 6 on sub-plan; thence north-westerly to a central point in said passageway, marked 7 on sub-plan; thence northerly to a central point in the northerly mouth of said passageway, marked 8 on sub-plan; thence still northerly to a point, marked 9 on sub-plan, equally distant from the headlands forming the northerly entrance to Wood's Holl; thence north $53^{\circ} 15'$ west, to the general division line between the towns on either side of Buzzard's Bay, as hereinbefore described.

Boundary Lines between Gay Head and Chilmark.

The boundary line between the waters of the towns of Gay Head and Chilmark, on the Vineyard Sound side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established at the mouth of Menamsha Creek, and running north 29° west to the general division line of Vineyard Sound, as hereinbefore described.

The boundary line on the ocean side begins at the end of the boundary line as heretofore established on the shore, and runs south $47^{\circ} 10'$ west to a point, marked 1 on plan, in the line connecting the most westerly headlands of Gay Head and No Man's Land; thence due west to a point, marked 2 on plan, in the line of the Commonwealth.

Boundary Lines between Chilmark and Tisbury.

The boundary line between the waters of the towns of Chilmark and Tisbury, on the Vineyard Sound side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north $54^{\circ} 30'$ west to the general division line of Vineyard Sound, as hereinbefore described.

The boundary line on the ocean side begins at the end of the boundary line as heretofore established on the shore, and runs south 5° east to the line of the Commonwealth.

Boundary Line between Tisbury and Edgartown.

The boundary line between the waters of the towns of Tisbury and Edgartown is located and defined as follows:

Beginning at the end of the boundary line as heretofore established on the shore, and running south $1^{\circ} 40'$ east to the line of the Commonwealth.

Boundary Line between Edgartown and Nantucket.

The boundary line between the waters of the towns of Edgartown and Nantucket is located and defined as follows : Beginning at a point, marked M¹⁰ on plan, in the line of the Commonwealth on the Nantucket Sound side, in latitude $41^{\circ} 23' 15''$, longitude $70^{\circ} 19' 15''$, and running south-westerly to a point, marked 1 on plan, in latitude $41^{\circ} 19' 23''$, longitude $70^{\circ} 22' 02''$; thence south $11^{\circ} 30'$ west to the line of the Commonwealth on the ocean side.

Boundary Line between Edgartown and Cottage City.

The boundary line between the waters of the towns of Edgartown and Cottage City is located and defined as follows : Beginning at the end of the boundary line as heretofore established at a central point in the inlet of Sengekontacket Pond, and running north-easterly to a point, marked 1 on plan, equally distant from the headlands at East Chop, Edgartown and Cape Poge; thence east more northerly to a point, marked 2 on plan, in the general division line of Vineyard Sound, as hereinbefore described.

Boundary Line between Cottage City and Tisbury.

The boundary line between the waters of the towns of Cottage City and Tisbury is located and defined as follows : Beginning at the end of the boundary line as heretofore established at and through the lagoon bridge, so called, and running north $39^{\circ} 30'$ west to a point, marked 1 on plan, midway between the shores of Vineyard Haven harbor; thence north-easterly to a central point in the mouth of said harbor, marked 2 on plan; thence east more northerly to a point, marked 3 on plan, in the general division line of Vineyard Sound, as hereinbefore described.

Boundary Line between Falmouth and Mashpee.

The boundary line between the waters of the towns of Falmouth and Mashpee is located and defined as follows :



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OLD COLONY RAILROAD
AND
CONNECTIONS.



Beginning at the end of the boundary line as heretofore established, at a central point in the mouth of the outlet of Waquoit Bay, and running south $7^{\circ} 15'$ east to the general division line of Vineyard Sound, as hereinbefore described.

Boundary Line between Mashpee and Barnstable.

The boundary line between the waters of the towns of Mashpee and Barnstable is located and defined as follows: Beginning at the end of the boundary line as heretofore established, at a central point in the mouth of the outlet of Popponesset Bay, and running south $37^{\circ} 45'$ east to the line of the Commonwealth.

Boundary Lines between Barnstable and Yarmouth.

The boundary line between the waters of the towns of Barnstable and Yarmouth, on the Nantucket Sound side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established, and running southerly and westerly, following substantially the line of the channel of Lewis Bay, to a central point, marked 1 on plan, in the mouth of its outlet; thence running south-westerly to a central point, marked 2 on plan, in a line drawn from Point Gammon to Hyannis Point; thence running south $1^{\circ} 15'$ west to the line of the Commonwealth.

The boundary line on the Massachusetts Bay side, begins at the end of the boundary line as heretofore established, at the central point in the mouth of Mill Creek, and runs north $11^{\circ} 45'$ west to the line of the Commonwealth.

Boundary Lines between Yarmouth and Dennis.

The boundary line between the waters of the towns of Yarmouth and Dennis, on the Nantucket Sound side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established, at a central point in the mouth of Bass River, and running south 15° east to the line of the Commonwealth.

The boundary line on the Massachusetts Bay side, begins at the end of the boundary line as heretofore established, at the central point in the mouth of Bass Hole, and runs north $12^{\circ} 30'$ west to the line of the Commonwealth.

Boundary Line between Dennis and Harwich.

The boundary line between the waters of the towns of Dennis and Harwich is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running south $11^{\circ} 30'$ east to the line of the Commonwealth.

Boundary Line between Harwich and Chatham.

The boundary line between the waters of the towns of Harwich and Chatham is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running south 27° west to the line of the Commonwealth.

Boundary Line between Chatham and Orleans.

The boundary line between the waters of the towns of Chatham and Orleans is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running south $85^{\circ} 15'$ east to the line of the Commonwealth.

Boundary Lines between Orleans and Eastham.

The boundary line between the waters of the towns of Orleans and Eastham, on the ocean side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north 82° east to the line of the Commonwealth.

The boundary line on the Massachusetts Bay side, begins at the central point in the mouth of Rock Creek, and runs north $68^{\circ} 30'$ west to the line of the Commonwealth.

Boundary Lines between Eastham and Wellfleet.

The boundary line between the waters of the towns of Eastham and Wellfleet, on the ocean side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north $75^{\circ} 30'$ east to the line of the Commonwealth.

The boundary line on the Massachusetts Bay side, begins at the central point in the mouth of Hatch's Creek, and runs south $79^{\circ} 25'$ west to the line of the Commonwealth.

Boundary Lines between Wellfleet and Truro.

The boundary line between the waters of the towns of Wellfleet and Truro, on the ocean side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north $64^{\circ} 30'$ east to the line of the Commonwealth.

The boundary line on the Massachusetts Bay side, begins at the end of the boundary line as heretofore established on the shore, and runs south $74^{\circ} 30'$ west to the line of the Commonwealth.

Boundary Lines between Truro and Provincetown.

The boundary line between the waters of the towns of Truro and Provincetown, on the ocean side, is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north $13^{\circ} 45'$ east to the line of the Commonwealth.

The boundary line on the Massachusetts Bay side, begins at the end of the boundary line as heretofore established, at a stone post standing on the shore of East Harbor as the same was at the time said line was established, and runs south-easterly, in the course of said boundary line extended, a distance of 730 feet to a point, marked 1 on a sub-plan, being the United States Coast Survey harbor chart of Provincetown harbor; thence south-westerly to a point in the centre of the State dike, marked 2 on sub-plan; thence south 1° west a distance of $5\frac{7}{8}$ statute miles to a point marked 3 on sub-plan; thence south $62^{\circ} 40'$ west to the line of the Commonwealth.

Boundary Line between Orleans and Brewster.

The boundary line between the waters of the towns of Orleans and Brewster is located and defined as follows: Beginning at the end of the boundary line as heretofore established, at the central point in the mouth of Skaget Creek, and running north $62^{\circ} 45'$ west to the line of the Commonwealth.

Boundary Line between Brewster and Dennis.

The boundary line between the waters of the towns of Brewster and Dennis is located and defined as follows: Beginning at the end of the boundary line as heretofore established, at the central point in the mouth of Quivett Creek, and running north $22^{\circ} 30'$ west to the line of the Commonwealth.

Boundary Line between Barnstable and Sandwich.

The boundary line between the waters of the towns of Barnstable and Sandwich is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north $3^{\circ} 30'$ east to the line of the Commonwealth.

Boundary Line between Sandwich and Plymouth.

The boundary line between the waters of the towns of Sandwich and Plymouth is located and defined as follows: Beginning at the end of the boundary line as heretofore established on the shore, and running north 77° east to the line of the Commonwealth.

HARBOR IMPROVEMENTS BY THE GENERAL GOVERNMENT.

Boston Harbor.

In reporting upon the work done by the general government in the several harbors and waters of the Commonwealth, the Board regrets having to announce the loss of the services of two of the older and more distinguished officers of the United States Engineer Corps, who have long had charge of this work, and to whose personal knowledge, experience and interest much of its success has been due. The prompt and courteous attention with which they have uniformly responded to the requests of the Board for information and advice in matters relating to its work, has given additional value to the assistance rendered.

The death of Lieut. Col. G. K. Warren, Corps of Engineers, Brev. Maj. Gen. United States Army, occurred at Newport, R. I., his headquarters, on the 8th of August, 1882.

The contemplated retirement from active service of Lieut. Col. George Thom, Corps of Engineers, Brev. Brig. Gen. United States Army, will probably take place in February, 1883.

The public is not generally aware of the importance and magnitude of the works entrusted to the officers of the United States Engineers, of the accuracy of the examinations made, and of the care and thoroughness required in the execution of the work which enables a great ship to pass freely and safely over bars and ledges which were not only barriers to the entrance of our ports and harbors, but the hidden sources of danger and destruction.

During the last year, between the 20th of April and the 4th of December, 65,327 cubic yards of material have been removed from the "Anchorage Shoal" in the main basin of Boston Harbor, and the main ship channel has been thereby opened to a depth of 23 feet at mean low water, for an aggregate width of 1,000 feet at its easterly end, increasing to a width of 1,500 feet at its westerly end.

Repairs have been completed on the sea-walls of Gallop's Island, and of the north head of Long Island, and those on the sea-wall of Lovell's Island have been nearly finished.

In addition to, and in completion of, the work executed in 1881, the Mystic River has been improved by the dredging of an aggregate of 82,000 cubic yards, whereby the channel has been opened to a depth of 23 feet at mean low water, for a length of 2,930 feet, with a least width of 375 feet, and a greatest width of 435 feet.

No work has been done in the Charles River during the past year. There is now available, including the amount (\$67,500) appropriated by the River and Harbor Bill of August, 1882, a total of \$97,000 for the further improvement of this river.

In addition to the work reported last year, the width of Nantasket Beach Channel has been increased from 70 to 100 feet, and the sunken ledges near the mouth of Weir River broken up and removed, leaving a depth of $9\frac{1}{2}$ feet at mean low water.

By the River and Harbor Bill of August, 1882, the sum of \$96,500 was appropriated for the improvement of Boston

Harbor, \$67,500 of which was for the improvement of Charles River, as above stated, leaving \$29,000 to be applied to other works. Of this last amount about \$8,500 has been expended in the repairs of the sea-walls of the islands, before mentioned, and the remainder is to be applied next season to the repairs of the sea-walls of Great Brewster, Deer, Rainsford and Lovell's islands, and to the widening of the main ship channel at the western end of the Upper Middle Bar, in order to afford a more direct sailing course to vessels passing through the Anchorage Shoal Channel.

For completing the repairs on the sea-walls of the islands, and for all the other work hitherto projected for the improvement of this harbor, the sum of \$30,000 was asked in the last annual report of Gen. Thom to the Chief of Engineers.

The provision made by this Board during the past year, under a contract with the New England Dredging Company, already referred to, for receiving and depositing upon the South Boston flats all dredged material that might be offered, has given increased facility and economy to the work of the general government, as well as to that of the Commonwealth in the reclamation of the flats.

By the River and Harbor Bill of August, 1882, \$10,000 was appropriated for the improvement of Malden River, a tributary of the Mystic River. No work has yet been done under this appropriation.

The total amount appropriated by the general government for the improvement of the whole harbor, between March 2, 1867, and August 2, 1882, reaches the large sum of \$1,602,500, which has been expended in protecting the headlands of the harbor, removing dangerous obstructions, making an improved channel by which the largest ocean steamers have access to the inner port, and in deepening and enlarging the anchorage and navigable area of the inner basins.

Newburyport Harbor.

The revised estimate for the work of the general government, in charge of Gen. George Thom, of building the stone jetties at the mouth of this harbor, is \$465,000, instead of \$365,000, as reported last year. The appropriations already made amount to \$130,000. The northerly jetty is now built out, to its full height and width, a distance of about 1,500

feet from Salisbury Beach, and rubble stone has been deposited, for an additional distance of about 300 feet, along the axis of the jetty. The appropriation made August 2, 1882, \$40,000, is to be applied to the commencement of the southerly jetty at the northerly extremity of Plum Island, and to the building of a dike across the outlet of the "basin," in order to prevent the opening of a new channel from the sea through the basin into the harbor.

Merrimac River.

The work of the general government in this river has already been referred to in another part of our report.

Lynn Harbor.

A survey of this harbor was made by the general government in 1881, with a view to its improvement, and a plan of work to be done has been submitted to the Engineer Department, the estimated cost of which is \$270,000. By the River and Harbor Bill of August, 1882, the sum of \$60,000 was appropriated for this harbor.

In consequence, it is presumed, of the death of Gen. Warren and the resignation of Gen. Thom, a change has been made by the Engineer Department in the assignment of specific work, as well as in the *personnel* of the corps. By the courtesy of Major Franklin Harwood, U. S. Engineer, the Board has received a manuscript statement of the present condition and proposed improvement of Scituate, Plymouth, Provincetown, Hyannis and Wareham harbors, now under his charge; and also a printed copy of the report of work done in the same harbors, under the direction of Gen. Thom, for the fiscal year ending June 30, 1882, in substance as follows:—

Scituate Harbor.

The work done in this harbor, during the past year, has been the placing of about 10,000 tons of rubble stone in the breakwater, whereby its outer portion has been partially built for a length of about 470 feet, and to a height of about 3 feet above the plane of mean high water, with a thickness of about 10 feet on the top, so as to form a partial protection to the harbor.

Plymouth Harbor.

Forty-four thousand nine hundred and sixty-nine cubic yards of dredging have been done, in completion of the projected channel and basin in this harbor.

Gen. Thom further reports that, —

“All the works projected for the protection and preservation of Long Beach were completed in 1879. Some of these works (bulkheads and jetties) were built of crib-work about fifteen years ago, but owing to their exposed position at the outer end of the beach, and *particularly* to the unusually severe storms that occurred in February and March last, they have become much decayed and broken up, so much so that the beach has been much abraded, and weakened to such an extent as to render it liable to immediate destruction. The attention of the department was called to this matter in a special report, dated March 30, 1882, with a recommendation that Congress be requested to make an appropriation of \$14,000 for the purpose of extending the stone bulkhead along the western shore of the beach for an additional distance of 1,000 feet, so as to protect in a more permanent manner this the weakest part of the beach.

“With the unexpended funds available, 219 $\frac{1}{2}$ $\frac{44}{10}$ tons of rubble stone have been placed in the bulkhead during May and June, 1882; and it is proposed to apply the appropriation for the fiscal year ending June 30, 1883, to the continuation of this work.”

The later report and communication of Major Harwood to the Board, concerning the harbors of Provincetown, Hyannis and Wareham, with a further statement concerning Scituate and Plymouth harbors, will be found in the Appendix.

Nantucket Harbor.

The government work on the southern coast of the Commonwealth, which includes this harbor, was in charge of the late Gen. G. K. Warren, whose report, made June 30, 1882, gives the following statement of the progress of the work up to that date: —

At the date of the last annual report, the construction of the jetty, under contract dated December 28, 1880, was in progress.

During the fiscal year ending June 30, 1882, the work has been in progress under the same contract; 8,134 $\frac{1}{2}$ tons were placed in the work, which makes the total number of tons delivered 12,123 $\frac{7}{10}$, and leaves about 3,871 tons still to be furnished. The length of the jetty is about 1,650 feet.

During the year frequent surveys have been made to ascertain the effect of the work, and in May, 1882, a full survey of the outer harbor was made.

A comparison of the maps of these surveys shows a continuous deposit of sand in the west angle formed by the jetty and the shore. The high-water line at the jetty has advanced 150 feet. On the east side, in the early stages of the work, the sand was cut out, and in a severe storm from the north, on October 5, a considerable inroad was made on the shore immediately east of the work. To arrest this, short spurs were built at right angles to the jetty from near the shore out for 150 feet; since the building of these the sand has been deposited and the shore line advanced considerably, but not so much as on the west of the jetty.

The depth of water has increased over a considerable area between the jetty and the deep channel at Brant Point, while on the west side, from the outer end toward the shore, the depth has decreased. The current during ebb tide has increased, and it now flows northwestwardly out past the jetty; it is on this line that the increase in depth is noted

Edgartown Harbor.

The subject of the re-opening of the south beach of Cotamy Bay, and thus restoring the "south inlet" to Edgartown Harbor, which existed for many years prior to 1869, has been fully discussed by Gen. Warren, who has also given a history of the work done, with this end in view, in 1873; but his report is too voluminous to allow more than the following extracts, which refer to a proposed new opening at the south-western corner of this bay: —

The opening that was made in 1873, was made at the western end of the beach, under the belief that if it enlarged so as to become an inlet, it would gradually move eastward, and close as the last one had done. The western location thus promised a longer existence for the inlet.

The present location near the eastern end, would allow of but a comparatively short period, if the inlet formed and moved as the natural ones had done. It is therefore proposed to hold it in position by means of a jetty on the west side of the opening.

The width of the channel through the inside shoal, to allow the vessels in use to beat, need not exceed 200 feet. This is the greatest width of the existing channel. It will have to be widened in places, and considerably deepened in other places by dredging, to make 4 feet at mean low-water. To work the scows and tug, we shall have to make a depth of 6 feet, for a width of 60 feet, at mean low-water.

It does not now appear that the width of the beating channel need be any greater than 200 feet for the permanence of an inlet.

The wider, however, we can make the opening in the beach, the better

the chances of its becoming an inlet, and a cut 300 feet wide, 6 feet deep at mean low-water, is what is proposed, all to be done by dredging.

The place on the beach selected by the committee, is shown on the map near the former opening of 1846. It will be so marked off that the west side, or west chop (if it becomes an inlet), shall not be less than 500 feet from Chappaquiddick Island. This is the width of the narrowest natural inlet described by Mr. Whiting. That one we know succumbed in its battle with the waves and sands, but it sustained the contest alone, and it is proposed in the future to aid it in resisting encroachment in the best way we can.

Vineyard Haven Harbor.

By a resolution of Congress, passed January 24, 1882, Gen. Warren was required to ascertain the condition of this harbor, and whether any work is necessary for its protection.

In his report to the Chief of the United States Corps of Engineers, Gen. Warren discusses various projects for the improvement of this harbor, and gives the estimated cost of different breakwaters, ranging from \$1,250,000 to \$8,000,000.

In regard to the washing of the headlands of this important harbor, Gen. Warren says:—

The wearing away of the headland of "East Chop," [found by the Coast Survey, in 1871, to have been 75 feet in 15 years], is said to have continued since that time. The people who live in the vicinity have done a great deal to protect the bluff, and their efforts should undoubtedly be seconded by the general government. If the action is allowed to go on, it will not be long before the lighthouse will have to be removed.

To protect this headland will probably require that it be riprapped to above the highest waves. As a preliminary, I submit the following estimate:—

For protecting 5,000 feet of bluff would probably require	
40,000 tons of riprap, at \$1.50	\$60,000

Wood's Holl Harbor.

No work has been actually done in the improvement of this harbor during the last year; but surveys have been made for a pier and breakwater, the estimated cost of which is \$52,775. The following letter from Professor Spencer F. Baird, U. S. Commissioner of Fish and Fisheries, to General Warren, U. S. A., presents in a very full and interesting

manner the objects had in view in this work, and the value of the improvements proposed :

UNITED STATES COMMISSION, FISH AND FISHERIES,
WASHINGTON, D. C., December 17, 1881.

SIR:—I have the honor to enclose herewith a memorandum in reference to the importance of the proposed pier and breakwater in the Greater Harbor of Wood's Holl, Massachusetts, to the interests of navigation in general, and to those of the United States in particular.

Very respectfully, your obedient servant,

SPENCER F. BAIRD,
Commissioner.

Maj. Gen. G. K. WARREN, U. S. A.

[*Memorandum.*]

There are very few safe harbors, especially for vessels of over 10 feet draught, on the south coast of New England between Newport and Provincetown, the principal being Tarpaulin Cove on the island of Naushton, Wood's Holl, Vineyard Haven, Edgartown, Nantucket, and Hyannis, Provincetown being next in the series. Of these, the harbors of Tarpaulin Cove and Vineyard Haven are available only during the prevalence of certain winds, while those of Edgartown and of Nantucket (the bar of which can only be crossed at high tide and by low-draught vessels) are of insufficient depth, and very much out of the course of vessels. The harbor of Hyannis is formed simply by a breakwater in an open roadstead. In the range indicated, the Greater Harbor (as distinguished from a smaller) at Wood's Holl is by far the best, although access to it is somewhat difficult, in consequence of a narrow entrance. Here there is a depth of water ranging from 20 to 60 feet, which is ample for vessels of any class. No danger need be apprehended, except when heavy winds blow directly from the south, the quarter whence cyclone storms are very apt to come. The construction, however, of a pier or breakwater along either one of two shoals, making out directly from the mainland, would convert this harbor into an absolutely land-locked inclosure, under the shelter of which vessels might lie safe from any conceivable storm.

The United States Fish Commission, besides carrying on with success the reproduction of the shad, salmon, whitefish, and other useful freshwater fishes, has of late years been turning its attention to the multiplication of the fishes of the sea, from which results of the greatest importance are expected. Experiments made with the cod, Spanish mackerel, sea-bass, and striped bass have been entirely successful, and authorize the assurance of success in the application of the same principles to other species, such as the common mackerel, haddock, sheephead, tautog, weakfish, etc. The importance of arresting the very rapid diminution of these fish, and the still greater necessity of increasing their abundance to the extent within the power of applied science, make the selection of a station for carrying on this work on a large scale, a matter of greater moment. The requirements are a reasonably mild cli-

mate for the winter work, water perfectly pure and free from sewage, the aeration of this water, and accommodations for keeping the live fish for a certain time, with proper change of water and food during the interval. All this is, of course, contingent upon the occurrence of fish in considerable numbers and in proximity to seines and pounds, by which they may be taken alive and uninjured.

The method of procedure in the multiplication of these fish, is to catch the parent fish before the eggs are entirely ripe, bring them to the station in smacks or tow-cars, and transfer them to basins or floating cars, where they can be properly cared for. The eggs, when ripe, are then removed by well-known processes of manipulation. Sometimes weeks will elapse before the fish are ready to be "stripped," and, unless they have natural surroundings, they will suffer by the detention. In previous experiments of the United States Fish Commission, the fish were kept in large floating boxes or cars. In their attempts to pass through the gratings of these boxes, the fish were constantly receiving injuries, while the inclemency of the winter, during which the work was of necessity prosecuted, caused many to freeze to death before the operation was perfected.

It is contemplated to so construct the pier in question at Wood's Holl, that it shall inclose a number of subdivisions or basins, where the fish can be kept until ready for use. The passage of the tides through the openings between the mainland and the island of Naushon, causes an agitation of the water, whereby it is brought to the site of the proposed pier in a perfect foam, thus assuring the best possible conditions for the fish. It is confidently believed that at such a station there will be an opportunity to hatch out many hundreds of millions of eggs every year. A portion of the young fish would be turned out into the adjacent waters, and the remainder transferred by the vessels of the Fish Commission to points further south, possibly even to the Carolinas.

So far as the United States Fish Commission is concerned, this pier will also furnish a great desideratum in the way of a station at which its vessels can be kept, or can resort, when engaged in the prosecution of the practical investigations into the movements and abundance of the useful food-fishes.

Congress has thought fit to make an appropriation to the commission for the construction of a sea-going vessel of nearly 15 feet draught, whose explorations shall aid in the solving of many practical problems; at present, however, there is no available wharf on the south coast of New England (the best starting-point) to which this vessel can tie up for the purpose of taking on board supplies, etc., or delivering them on shore.

In addition to general service in the interest of commerce, and of the operations of the United States Fish Commission, this station will be available to other branches of the government service. It is particularly important for the Revenue Marine to enjoy the advantages afforded by such a station, and these the Fish Commission would be most happy to share with it. Four revenue cutters cruise on the south coast of New England, especially during the winter, and have constant occasion to

refit and take in coal, water, and other supplies. At the same time they require to be in close communication with the Treasury Department, and with the custom houses of Boston, New Bedford, Newport, etc. At present, their coaling and supplying station is at Edgartown, on an island, access to which is difficult and involves a delay of hours, especially in the winter season. No telegraph wires connect Edgartown with Boston, New Bedford, or Newport. If the principal station were established at Wood's Holl, in consequence of this improvement, the coal might be stored there; fresh water could be had directly at the wharf, and all necessary telegraph facilities obtained in the depot of the Old Colony Railroad, which is within a few hundred yards.

Other vessels of the government would likewise be benefited, especially those of the Light House Board. This board has a station in the "Little Harbor" at Wood's Holl, about half a mile from the proposed pier, which, however, its boats of large draught cannot enter, such vessels as the *Fern*, for instance, being obliged to anchor outside the harbor, instead of proceeding directly to the wharf to discharge or receive supplies of oil, etc.

PLANS APPROVED AND LICENSES GRANTED, DURING THE YEAR
1882, FOR THE ERECTION OF STRUCTURES IN AND OVER
TIDE WATER.

Nos.

651. Trustees under the will of Ebenezer Francis, for leave to change the mode of construction of Francis' Wharf, Fort Point Channel, as granted to them Nov. 28, 1881. Approved Jan. 5, 1882.
652. Joseph A. Bowen, for leave to straighten the south-erly side of his wharf, known as the "Slate Wharf," in the City of Fall River. Approved Jan. 5, 1882.
653. William G. Brown, for leave to fill solid a portion of his wharf, known as the "Cob Wharf," on Ipswich River, in the town of Ipswich. Approved Feb. 2, 1882.
654. Trustees of the Harris Estate, for leave to extend Harris' Wharf in Boston Harbor to the Harbor Line. Approved Feb. 9, 1882.
655. Henry Howard, of New Bedford, for leave to construct a pile wharf in Onset Bay, in the town of Wareham. Approved March 16, 1882.
656. J. C. Kittredge, for leave to extend his wharf on First Street, South Boston. Approved March 16, 1882.
657. Benjamin D. Dixie, for leave to extend his wharf at Marblehead. Approved March 16, 1882.
658. Magee Furnace Company, for leave to extend its wharf on Marginal Street, Chelsea, to the Harbor Line. Approved March 23, 1882.
659. Henry L. Pierce, for leave to build a sea-wall in front of his land bordering on Neponset River, in the town of Milton, and fill solid the area enclosed by such wall. Approved March 23, 1882.
660. Abbie E. Cutter, Henry B. Cutter, and William O. Cutter, for leave to construct a wharf, partly solid and partly on piles, on the west side of Wickets Island, in Onset Bay, town of Wareham. Approved March 23, 1882.

Nos.

661. The Hingham, Hull and Downer Landing Steamboat Company, for leave to extend its wharf on piles, in the town of Hull. Approved April 12, 1882.
662. The White's Ferry Bridge Company, for leave to construct a bridge across North River, between the towns of Marshfield and Scituate. Approved April 5, 1882.
663. The Bradley Fertilizer Company, for leave to extend and maintain its present wharf on Weymouth Back River, in the town of Weymouth. Approved April 5, 1882.
664. Edward C. Ellis, for leave to construct a wharf on the south shore of Onset Bay, in the town of Wareham. Approved April 12, 1882.
665. The Standard Sugar Refinery, for leave to extend its wharf on Fort Point Channel, South Boston, on piles. Approved April 27, 1882.
666. The Old Colony Railroad Company, for leave to extend its wharf in Taunton River, at Somerset. Approved May 11, 1882.
667. County Commissioners of Essex County, for the construction of a part of Essex Merrimack Bridge, under chapter 104 of the Acts of the year 1882. Approved May 13, 1882.
668. South Boston Yacht Club, for leave to construct a pile wharf at City Point, South Boston, on the west side of Sixth Street. Approved May 18, 1882.
669. Trustees under the will of Augustus Hemenway, for leave to extend Howe's Wharf, on Fort Point Channel, to the Harbor Line. Approved May 18, 1882.
670. Joseph A. Bowen, for leave to extend "Slate Wharf" on its southerly side, in the City of Fall River. Approved May 18, 1882.
671. The Boston and Lowell Railroad Corporation, for leave to construct a sea-wall along the Harbor Line, west of its freight bridge across Charles River, in the City of Boston. Approved June 1, 1882.

Nos.

672. The Road Commissioners of the town of Quincy, for leave to fill solid a part of Neponset Bridge. Approved May 25, 1882.
673. Stephen M. Weld of Dedham, for leave to construct two breakwaters in Buzzard's Bay, in the town of Wareham. Approved May 25, 1882.
674. The City of Gloucester, for leave to build a highway, in line of Washington Street, across the Mill Pond. Approved June 1, 1882.
675. Samuel Elliott, for leave to extend his wharf on Merrimack River at Haverhill. Approved June 8, 1882.
676. Worin Tasker, for leave to extend his wharf on Merrimack River at Haverhill. Approved June 8, 1882.
677. John E. Gale, for leave to extend his wharf on Merrimack River at Haverhill. Approved June 8, 1882.
678. James R. Nichols, for leave to extend his wharf on Merrimack River at Haverhill. Approved June 8, 1882.
679. W. R. Whittier, for leave to extend his wharf on Merrimack River at Haverhill. Approved June 15, 1882.
680. Albert L. Kimball, for leave to extend his wharf on Merrimack River at Haverhill. Approved June 15, 1882.
681. Goodrich and Porter, for leave to extend their wharf on Merrimack River at Haverhill. Approved June 15, 1882.
682. Trustees under the will of Augustus Hemenway, for leave to build a sea-wall and fill solid at Howe's Wharf, so called, on Fort Point Channel, Boston. Approved June 22, 1882.
683. Jesse Tirrell, for leave to construct a sea-wall and fill solid at his wharf on Fort Point Channel, Boston. Approved June 22, 1882.
684. Benjamin Montgomery, for leave to extend his wharf in Gloucester Harbor. Approved June 22, 1882.
685. George Dennis, for leave to extend his wharf in Gloucester Harbor. Approved June 22, 1882.

Nos.

686. B. F. Wild & Co., for leave to drive a row of piles for the protection of their wharf on Mystic River. Approved June 29, 1882.
687. County Commissioners of Essex County, for a change in the construction of the Essex Merrimack Bridge, between the towns of Newbury and Salisbury, over Merrimack River. Approved July 6, 1882.
688. Moseley and Potter, for leave to drive piles for the support of a water-tank on Congress Street Bridge, Fort Point Channel, Boston. Approved July 6, 1882.
689. Jesse Tirrell, for leave to extend his wharf to the Harbor Line on Fort Point Channel, Boston. Approved July 13, 1882.
690. Amos A. Story, for leave to extend his wharf, partly solid and partly on piles, in Gloucester. Approved July 20, 1882.
691. Reed and Gamage, for leave to extend their wharf in Gloucester Harbor. Approved July 20, 1882.
692. Standard Fertilizer Company, for leave to construct a wharf in Duxbury Bay. Approved Aug. 3, 1882.
693. Board of Directors of the East Boston Ferries, for leave to extend and reconstruct its Piers on the Boston side of the North Ferry. Approved Aug. 10, 1882.
694. J. H. Durgin, for leave to extend his wharf on Merrimack River at Haverhill. Approved Aug. 10, 1882.
695. Charles W. and R. Stuart Chase, for leave to extend their wharf on Merrimack River at Haverhill. Approved Aug. 10, 1882.
696. A. H. Adams, for leave to extend his wharf on Merrimack River at Haverhill. Approved Aug. 10, 1882.
697. Eastern Railroad Company, for the reconstruction of the draw-pier in its bridge across Merrimack River at Newburyport. Approved Aug. 10, 1882.
698. City of Haverhill, for leave to extend City Landing No. 10 on Merrimack River. Approved Aug. 31, 1882.

Nos.

699. George A. Green, for leave to extend his wharf on Merrimack River at Haverhill. Approved Aug. 31, 1882.
700. John P. Gilman, for leave to extend his wharf on Merrimack River at Haverhill. Approved Aug. 31, 1882.
701. John D. Hillard, for leave to extend his wharves at Provincetown. Approved Sept. 14, 1882.
702. Thomas R. Whorf, for leave to extend and widen his wharf at Provincetown. Approved Sept. 14, 1882.
703. The Boston and Hingham Steamboat Company, for leave to construct a dolphin in Chelsea Creek. Approved Oct. 12, 1882.
704. S. S. Swift, for leave to extend his wharf in Provincetown Harbor. Approved Oct. 12, 1882.
705. City of Boston, for leave to extend the southerly pier of the East Boston South Ferry, East Boston. Approved Oct. 13, 1882.
706. Onset Bay Grove Association, for leave to extend its wharf at Onset Bay, Wareham. Approved Nov. 2, 1882.
707. Edward P. Shaw, for leave to construct a wharf at Salisbury Point, near Badger's Rocks, on Merrimack River. Approved Nov. 16, 1882.
708. Naumkeag Steam Cotton Company, for leave to drive a line of piling for the foundation of a sea-wall on South River, Salem Harbor. Approved Nov. 23, 1882.
709. Edward P. Shaw, for leave to construct a wharf on the northwesterly end of Plum Island, on Merrimack River, at Newburyport. Approved Nov. 23, 1882.
710. Nantucket Railroad Company, for leave to construct a solid roadway across tide-water in Nantucket Harbor. Approved November 23, 1882.
711. County Commissioners of Essex County, for the reconstruction of the draw and draw pier, in Rocks Bridge, across Merrimack River, between Haverhill and West Newbury. Approved Dec. 1, 1882.

Sixty-one licenses have been granted. Applications for others, which the Board has felt obliged to refuse, have perhaps occupied quite as much of its time, and occasioned more study and perplexity. In all cases, a careful examination of the localities and plans of the works proposed, has been made by the Board and its Engineers.

ARCHIVES OF MAINE LANDS.

This Board, under various legislative acts, has succeeded to the powers and duties of the former Land Agents of the Commonwealth,— among which is the custody of the records of lands once held and conveyed by Massachusetts, and now within the limits of the State of Maine. By chapter 58 of the Resolves of 1873, a portion of these records was transferred to the latter State; and the records of Maine lands granted as bounties to revolutionary soldiers and their heirs, have always been in the custody of the Secretary of this Commonwealth. This Board is still responsible for the safe keeping of seven volumes of records of conveyances by this Commonwealth of lands in Maine, one volume of the like records of lands in Madawaska, one volume containing the plans and records of the drawings of the “ Lottery Lands,” so called, in the easterly section of Maine, and an old account book, containing a record of the receipts and disbursements of the Land Agents on account of the above lands, from the year 1823 to the year 1853.

These records, apart from their historical interest, have no present value except as furnishing evidence of title to lands in another State; and record copies, to have legal effect, must be certified by the Secretary of the Commonwealth. As a matter of fact, most of the above volumes are now, for convenience in the investigation and proof of titles, in the Secretary's office, this Board holding his receipt therefor; and it is respectfully recommended that all the archives of Maine lands be placed by law in the charge and custody of that officer, to be kept in his office.

JOHN E. SANFORD.
FRANCIS A. NYE.
HENRY L. WHITING.

APPENDIX.

APPENDIX.

[1.]

[See page 5 of this Report, *ante*.]

AGREEMENT BETWEEN THE COMMONWEALTH AND THE BOSTON & ALBANY RAILROAD COMPANY ACTING BY THE NEW YORK & NEW ENGLAND RAILROAD COMPANY.

KNOW ALL MEN BY THESE PRESENTS, That

WHEREAS, by an agreement between the Boston & Albany Railroad Company and the New York & New England Railroad Company, made on the fifteenth day of July, A. D. 1880, and recorded with Suffolk Deeds, Lib. 1568, Fol. 45, to which reference may be had as if fully recited herein, said Boston & Albany Railroad Company agreed, upon and after a full performance by said New York & New England Railroad Company of each and all of its agreements thereby made, to release to it all the right, title and interest which said Boston & Albany Railroad Company had or could have, under and by virtue of any agreements theretofore made by it with the Commonwealth of Massachusetts, in or to any lands or flats in that part of Boston called South Boston, in said Commonwealth of Massachusetts, which said Commonwealth had theretofore agreed to convey to it, subject to all the terms, provisions and conditions of each and all of said agreements; and that said New York & New England Railroad Company might act as the attorney of said Boston & Albany Railroad Company, and in its name and behalf enforce, defend or settle any legal right, claim or liability of or against it under said agreements, or in regard to or in connection with said lands or flats, except as therein excepted, but only at the cost and expense of said New York

& New England Railroad Company, and without increasing or creating any liability of said Boston & Albany Railroad Company ;

AND WHEREAS, said Commonwealth, acting by its Board of Harbor and Land Commissioners, with the approval of its Governor and Council, and to the satisfaction of said Board, of the one part, and said New York & New England Railroad Company, and said Boston & Albany Railroad Company acting by said New York & New England Railroad Company as its attorney under the authority and power aforesaid, of the other part, have mutually agreed upon a full settlement, on the terms hereinafter set forth and agreed upon, of all matters, claims and demands asserted in the suit at law now pending in the Superior Court in and for the County of Suffolk, in said Commonwealth, or in the proceedings in equity now pending in the Supreme Judicial Court in and for said County of Suffolk, commenced against said Boston & Albany Railroad Company in pursuance of chapter fifty (50) of the Resolves passed by the General Court of said Commonwealth of Massachusetts in the year eighteen hundred and eighty (1880), or arising under or by virtue of all or any of the stipulations, agreements or provisions contained or made in or by said agreements between said Boston & Albany Railroad Company and said Commonwealth ;

NOW, THEN, IT IS HEREBY AGREED, on this first day of August, in the year 1882, by and between said Commonwealth, party hereto of the first part, and said New York & New England Railroad Company, and said Boston & Albany Railroad Company acting as aforesaid, party hereto of the second part, as follows, namely :

That the total sum or sums of money due or payable to said Commonwealth from said Boston & Albany Railroad Company, or from said New York & New England Railroad Company, on account of any or all of said matters, claims or demands, or under all or any of said agreements, including all principal, interest, damages and liabilities of every name and nature, is the sum of one hundred thousand dollars, and no more, with interest at the rate of five per centum per annum from the first day of May, in the year 1882.

And said New York & New England Railroad Company agrees with said Commonwealth, that said company will

(I.) Before or at the expiration of ten (10) years from and after the said first day of May, A. D. 1882, pay to said Commonwealth said sum of \$100,000, with interest from and after said first day of May at the rate of five per centum per annum, payable semi-annually on the first days of May and November in each year; and will accept instead of, and as and for a conveyance of the land which said Commonwealth in and by said agreements agreed to convey to said Boston & Albany Railroad Company, a conveyance in fee simple, free from all incumbrances except as hereinafter stated, of all that parcel of land situated in said South Boston, bounded and described as follows:

Beginning at the southerly corner of said parcel, at the intersection of the south-westerly side-line of Congress Street as located and laid out by the Board of Street Commissioners for the City of Boston, March 14, 1879, with the north-westerly side-line of "B" Street; thence running north $40^{\circ} 59' 59''$ east, along the north-westerly side-line of said "B" Street, seven hundred and ninety-one and fifty-seven one-hundredths ($791\frac{57}{100}$) feet; thence running north $30^{\circ} 06' 28''$ east, and bounded south-easterly by other land of the Commonwealth, one thousand five hundred and twenty-three and sixteen one-hundredths ($1,523\frac{16}{100}$) feet; thence north $61^{\circ} 01' 04''$ west, eight hundred and twenty-two and ninety-four one-hundredths ($822\frac{94}{100}$) feet; thence, on the arc of a curve of two thousand three hundred and seventy (2,370) feet radius, to which the said last-described line is tangent at its westerly end, one hundred and sixteen and seventy-three one-hundredths ($116\frac{73}{100}$) feet, more or less, to the dividing line, wherever it may be, between the land hereby agreed to be conveyed and other land known as the 25-Acre Lot, heretofore agreed to be conveyed by the said Commonwealth of Massachusetts to the said New York & New England Railroad Company, in accordance with the provisions of chapter two hundred and sixty (260) of the Acts of the General Court of Massachusetts for the year 1880. The course of a straight line which connects the ends of said last-described curved line is north $62^{\circ} 25' 44''$ west,

and its length is one hundred and sixteen and seventy-one one-hundredths ($116\frac{71}{100}$) feet, more or less. Thence continuing south $30^{\circ} 07' 50''$ west, along the said division line, and bounded north-westerly by the said 25-Acre Lot, one thousand and three hundred and seventeen and four-tenths ($1,317\frac{4}{10}$) feet, more or less; thence south $55^{\circ} 48' 31''$ east, and bounded south-westerly by land of the Boston Wharf Company, seventy and ninety-six one-hundredths ($70\frac{96}{100}$) feet, more or less, to a point which is on a south-easterly extension of the straight boundary line on the south-westerly side of the land hereinbefore referred to as to be conveyed in accordance with the terms of chapter 260 of the Acts of the General Court of Massachusetts for the year 1880, and is distant ninety-seven and fifty-seven one-hundredths ($97\frac{57}{100}$) feet from a copper bolt in a stone bound on the said boundary line, and is also distant one thousand and ninety-three (1,093) feet from the intersection of said south-westerly boundary line of said 25-Acre Lot with the harbor line on the easterly side of Fort Point Channel, as defined by chapter thirty-five (35) of the Acts of the General Court of Massachusetts for the year 1840; thence south $30^{\circ} 01' 35''$ west, and bounded north-westerly by land of the Boston Wharf Company and by Congress Street, eight hundred and eighteen and forty-five one-hundredths ($818\frac{45}{100}$) feet to a point in the south-westerly side-line of Congress Street hereinbefore referred to; thence south $49^{\circ} 00' 01''$ east, along the south-westerly side-line of said Congress Street, and bounded south-westerly by land of the Boston Wharf Company and other land known as the 12-Acre Lot, heretofore agreed to be conveyed by the said Commonwealth of Massachusetts to the said New York & New England Railroad Company, seven hundred and thirty-one and fifty-six one-hundredths ($731\frac{56}{100}$) feet to the point of beginning,—containing by estimation 1,976,654 square feet, more or less. For a more particular description, reference may be had to the accompanying plan.* Intending to include in the foregoing description all the land lying between, and bounded by, the exterior north-easterly line set forth in the accom-

* The plan referred to is on file in the offices of the Secretary and the Treasurer of the Commonwealth, and of this Board.

panying plan, the parcel of land known as the 25-Acre Lot described in chapter 260 of the Acts passed by the General Court of said Commonwealth in the year 1880, land of the Boston Wharf Company, the parcel of land described in said chapter as “a parcel of land and flats containing twelve acres, more or less,” “B” Street, so called, and a line running south $30^{\circ} 06' 28''$ west, one thousand five hundred and twenty-eight and sixteen one-hundredths ($1,528\frac{16}{100}$) feet from said exterior line to the point where said line intersects with the northerly line of “B” Street. All bearings or courses stated in the foregoing description, are to be referred to the meridian $71^{\circ} 00' 54.883''$ west longitude.

Said conveyance to be subject to any rights which the City of Boston may have acquired in Eastern Avenue or Congress Street, and to any obligations of the Commonwealth, under the agreements and indenture next hereinafter mentioned, in relation thereto; and to be subject to the rights as to the laying out of Northern Avenue, or of any drains or sewers on, over or in said parcel of land hereinbefore described, and said to contain by estimation 1,976,654 square feet, more or less, which are reserved to said Commonwealth and to the City of Boston in and by agreements between said Commonwealth and said Boston & Albany Railroad Company, dated on the eighth day of December, A. D. 1869, and on the twenty-fourth day of June, A. D. 1873, or in and by an indenture of four parts between said Commonwealth of the first part, said Boston & Albany Railroad Company of the second part, the Boston Wharf Company of the third part, and said City of Boston of the fourth part, dated on said twenty-fourth day of June, 1873, except so far as the rights so reserved to said Commonwealth are modified by express provisions of this agreement; and to be subject to any obligations of said Commonwealth, under said agreements and indenture, in relation to said parcel of land or any portion thereof.

And said New York & New England Railroad Company further agrees with said Commonwealth, that said Company will

(II.) Proceed forthwith to perform with all practicable

despatch all the filling and other work which said Commonwealth is now entitled to have performed by said Boston & Albany Railroad Company upon or in relation to said parcel of land, which filling and other work is agreed by the parties hereto to be the following only and no more ; that is to say :

(1) Fill with solid filling, to the grade of sixteen feet above mean low water, the area on the accompanying plan within a line drawn from *a* to *b* to *c* to *d* to *e* to *g* to *h* to *i* to *j* to *k* to *l* to *m* to *n* to *a*, the place of beginning. If the filling of said area along said line, from *l* to *m* to *n*, shall not be done in such time and manner as to protect the filling of the adjoining territory by said Commonwealth, then the said New York & New England Railroad Company shall, on demand, pay to said Commonwealth the actual cost of all material deposited by said Commonwealth on said adjoining territory, which may flow or form a slope upon said area along said line. The area bounded by and within a line beginning at point *e*, thence to *o*, thence to *p*, thence to *g*, thence to point *e*, the place of beginning, is for the present reserved for a dock : provided, that said company shall have the right, at any time within twenty-five (25) years from the date of this agreement, to fill said last-described area and build the sea-walls around said area so far as indicated on the accompanying plan, the work of filling and of building the said wall to be done in such way as shall be approved by said Board of Harbor and Land Commissioners ; but if said company does not within said twenty-five (25) years exercise said right of filling said last-described area, it shall be taken to have elected to have reserved the same for a dock.

(2) Complete the wall on Pier Number four (4) as shown on the accompanying plan, in such way as shall be approved by said Board of Harbor and Land Commissioners.

And said Commonwealth on its part agrees with said New York & New England Railroad Company, that said company shall be permitted to pay all or any part of said sum of \$100,000 at any time within the period of ten years aforesaid, after ten (10) days' notice of its intention so to do, with the interest accrued on the part so paid up to the date of such payment ; and that, upon the payment to said

Commonwealth by said New York & New England Railroad Company, or by said Boston & Albany Railroad Company, of the whole of said \$100,000 with the interest accrued thereon, or upon the giving of such security therefor as said Commonwealth, by its officers or agents hereafter duly authorized so to do, shall accept as satisfactory, said Commissioners not declaring that they have any authority so to accept, and upon the due performance of the filling and other work which said New York & New England Railroad Company is bound to do as aforesaid, and of all acts and things, other than filling or work or payment of money, which either of said Railroad Companies is bound to do, under the aforesaid agreements and indenture as modified by these presents, prior to the conveyance of said parcel of land by said Commonwealth, said Commonwealth, under the aforesaid agreements and indenture as modified by these presents, will convey by a good and sufficient warranty deed to said Boston & Albany Railroad Company, or to such grantee or assignee as the said Boston & Albany Railroad Company shall in writing designate or appoint, or to said New York & New England Railroad Company, upon the due execution and delivery of the release which said Boston & Albany Railroad Company, by the agreement first herein referred to, agrees, as therein stated, to give to said New York & New England Railroad Company, all said parcel of land, and all the land which as aforesaid the said foregoing description is intended to include, free from and of all incumbrances except as aforesaid.

And whereas Northern Avenue, so called, may be hereafter so laid out over said parcel of land that, by reason of the provisions of the agreements or indenture next hereinafter mentioned, said Boston & Albany Railroad Company or New York & New England Railroad Company may not be entitled to compensation therefor; and whereas the cost, at the rates hereinafter specified, of the portions of said parcel which may be so taken for said Northern Avenue, is included in said sum of \$100,000, and, in case of the laying out of said Northern Avenue without compensation for the reason aforesaid, ought not to be claimed or retained by said Commonwealth:

Now, then, the said Commonwealth doth further agree that, if and when said Northern Avenue is or shall be so laid out, whether by said Commonwealth or by the City of Boston, under the provisions of the aforesaid agreements of December 8, 1869, and June 24, 1873, or of the aforesaid indenture of June 24, 1873, over said parcel or any part thereof, provided, it is so laid out by said Commonwealth or said City of Boston in the due exercise of the rights reserved or given by said agreements or indenture, and in such manner and within such time, that said Commonwealth or City of Boston is not bound to make such compensation and does not incur any liability for land damages for so doing, said Commonwealth will deduct from said \$100,000, or credit on said \$100,000, the amount of the cost, at the rate of fifty (50) cents per square foot, of all that portion of the land hereby agreed to be conveyed which shall be included within said Northern Avenue as so laid out, and which lies between the boundary line dividing said land from the 25-Acre Lot, so called, as said line is shown on the accompanying plan, (described as S. 30° 07' 50" W. 1317.40 feet, more or less,) and a line drawn parallel to, and distant seventy and seventy-eight one-hundredths ($70\frac{78}{100}$) feet south-easterly from, said boundary line, and of the cost, at the rate of twenty (20) cents per square foot, of any other portions of said land so included within said Northern Avenue, with interest at five (5) per centum per annum from and after the first day of May, 1882, on said amount, or repay the same amount and interest, if already paid to it, to that one of said companies which shall have paid the same. And said Commonwealth on its part hereby releases to said Boston & Albany Railroad Company and to said New York & New England Railroad Company, all right which it has by virtue of the aforesaid agreement of December 8, 1869, to lay out said Northern Avenue on or over said parcel of land or any part thereof, at any time after two years after the filling and other work, hereinbefore stipulated to be done, has been completed, and written notice thereof given to said Commonwealth.

And in consideration of the premises, and of the sum of \$330,000 heretofore paid by said Boston & Albany Railroad

Company to said Commonwealth, said Commonwealth hereby releases and discharges said Boston & Albany Railroad Company of and from all debts, claims, demands, liabilities or obligations to or for the payment or performance of money, damages, filling, or other work, or any other matters or things arising under or by virtue of said agreements made by said Boston & Albany Railroad Company with said Commonwealth, or by reason of any breach thereof, and accepts said New York & New England Railroad Company in the place of said Boston & Albany Railroad Company, with all the rights and subject to all the liabilities which said Boston & Albany Railroad Company would have or be liable to under said agreements as modified by these presents, except that said Commonwealth agrees not to make to said New York & New England Railroad Company the conveyance aforesaid, except upon and after the full performance by it of all its agreements made in and by said first herein mentioned agreement of July 15, 1880, or upon the written request or with the written consent thereto of said Boston & Albany Railroad Company; and said Boston & Albany Railroad Company, acting as aforesaid by said New York & New England Railroad Company, doth hereby release, acquit, and discharge said Commonwealth of and from all claims and demands under said agreements for the conveyance to it, the said company, of any land situated in said South Boston, except said parcel of land and except the land which as aforesaid said foregoing description is intended to include.

And said Commonwealth and said Boston & Albany Railroad Company, acting as aforesaid by said New York & New England Railroad Company, and said New York & New England Railroad Company for itself, mutually accept these presents as a full accord and satisfaction of all claims and demands arising under any previous agreements relative to the subject-matters aforesaid.

IN TESTIMONY WHEREOF, on this first day of August, in the year 1882, the said Commonwealth of Massachusetts, acting by its Board of Harbor and Land Commissioners, hath caused its corporate seal to be hereto affixed, and these presents to be signed and delivered in its name and behalf, and the same to be approved by its Governor and Council;

and the said New York & New England Railroad Company, acting for itself, and as the attorney of the said Boston & Albany Railroad Company, by James H. Wilson, its president, thereunto duly authorized by vote of its directors, a copy of which vote is hereunto annexed, hath hereunto set its corporate name and seal; and the said Boston & Albany Railroad Company, by William Bliss, its president, thereunto duly authorized by vote of its directors, a copy of which vote is hereto annexed, in token of its assent to the provisions of the foregoing agreement, hath hereunto set its corporate name and seal.

COMMONWEALTH OF MASSACHUSETTS,

By JOHN E. SANFORD, } *Harbor and*
 FRANCIS A. NYE, } *Land*
 HENRY L. WHITING, } *Commissioners.*

[SEAL OF THE
COMMONWEALTH.]

NEW YORK & NEW ENGLAND RAILROAD COMPANY,

By JAMES H. WILSON, *President.*[SEAL OF
N. Y. & N. E.
R. R. CO.]

BOSTON & ALBANY RAILROAD COMPANY,

By NEW YORK & NEW ENGLAND R.R. CO., its Attorney,

By JAMES H. WILSON, *President.*

BOSTON & ALBANY R. R. CO.,

By WILLIAM BLISS, *President.*[SEAL OF
B. & A. R.R. CO.]

BOSTON, December 26, 1882.

At a meeting of the Directors of the New York & New England Railroad Company, held December 22, 1882, the following vote was passed:—

“A draft of a proposed agreement of settlement between this Company, as the attorney of the Boston & Albany Railroad Company, under the agreement between the Boston & Albany Railroad Company and this Company, dated July 15th, 1880, and the Commonwealth of Massachusetts, by which it is agreed that all liabilities shall be compromised for the sum of one hundred thousand dollars (\$100,000), with interest at five (5) per cent. from May 1st, 1882, was submitted by the General Solicitor of this Company; and, on motion of Mr. Hart, it was

“*Voted*, That the President of the Company be, and he hereby is, authorized, in its name and behalf, to sign its corporate name and set its common seal to the instrument which has just been submitted, dated the first (1st) day of August, 1882; provided, however,

that any modification in the details of said agreement, which may be deemed necessary or proper by the President and General Solicitor, may be made before the execution thereof."

A true copy from the record,

Attest:

[SEAL OF THE N. Y. &
N. E. R. R. CO.]

JAMES W. PERKINS,
Clerk of Board of Directors.

Boston, December 26, 1882.

We hereby certify that the foregoing instrument is the instrument submitted to the Directors of the New York & New England Railroad Company, at their meeting held December 22d, 1882, and referred to in the appended copy of vote passed at said meeting, with slight verbal changes approved by us.

JAMES W. WILSON,
President of N. Y. & N. E. R. R. Co.

WILLIAM CALEB LORING,
General Solicitor of N. Y. & N. E. R. R. Co.

Boston, January 3, 1883.

At a meeting of the Board of Directors of the Boston & Albany Railroad Company, duly held in the city of Boston this third day of January, A. D. 1883, the following vote was passed:—

Whereas, The Counsel of the Corporation has examined the proposed agreement of settlement of the controversy between the N. Y. & N. E. R. R. Co. and the Commonwealth of Massachusetts, relative to the South Boston Flats, and approves of the same,

Voted, That the President be authorized to consent to the same in writing in behalf of the corporation.

J. A. RUMRILL,
Secretary and Clerk.

COMMONWEALTH OF MASSACHUSETTS.

Boston, January 4, 1883.

Approved by the Governor and Council.

HENRY B. PEIRCE,
Secretary of the Commonwealth.

SECRETARY'S DEPARTMENT,
Boston, January 12, 1883.

[2.]

AGREEMENT BETWEEN THE BOSTON & ALBANY
RAILROAD COMPANY AND THE NEW YORK & NEW
ENGLAND RAILROAD COMPANY, REFERRED TO IN
THE PRECEDING AGREEMENT.

Memorandum of an Agreement, made this fifteenth day of July, A. D. 1880, by and between the Boston & Albany Railroad Company and the New York & New England Railroad Company.

Said Boston & Albany Railroad Company hereby, pursuant to the authority given it by St. 1869, ch. 461, and all other powers it has in the premises, agrees, upon and after a full performance by said New York & New England Railroad Company of each and all of its agreements hereby made, to release to it all the right, title and interest which said Boston & Albany Railroad Company has, or can have, under and by virtue of any agreements heretofore made with it by the Commonwealth of Massachusetts, in or to any lands, or flats, situate in that part of Boston, in said Commonwealth, called South Boston, which said Commonwealth has heretofore agreed to convey to it, subject to all the terms, provisions and conditions of each and all of said agreements.

And said New York & New England Railroad Company hereby agrees to pay to said Boston & Albany Railroad Company, forthwith, the sum of thirty thousand dollars, with interest at the rate of six per cent. per annum from and after the seventh day of February, A. D. 1879, and the sum of three hundred thousand dollars within ten years from said day, with interest thereon until paid, payable semi-annually on the first days of January and July of each year, at the rate of two per cent. per annum for the first five years, and at the rate of four per cent. per annum for the

next five years; and also to do, pay and perform all acts, work, moneys, interest, damages, matters and things of any kind or description whatever, which said Boston & Albany Railroad Company has agreed, or was, is now, or may or can hereafter be, legally bound or required to do, pay or perform, either by, under or in consequence either of, or of any breach of, all or any part or clause of any agreement or agreements heretofore made by it with said Commonwealth, or any other person or corporation, for or in relation to said lands or flats, or any work or materials already or to be done or furnished to, for, upon, in relation to, or in connection with said lands or flats, or as owning or interested in said lands or flats, or any part thereof; excepting work or materials in fact done or furnished before the tenth day of September, A. D. 1878, or moneys heretofore paid by it to said Commonwealth.

Said New York & New England Railroad Company may occupy and use said lands and flats if, and so long only as, it shall fulfil and perform its agreements hereby made; and may act as the attorney of said Boston & Albany Railroad Company, and, in its name and behalf, enforce, defend or settle any legal right, claim or liability of or against it under said agreement or agreements, or in regard to or in connection with said lands or flats, except as aforesaid, but only at the cost and expense of the said New York & New England Railroad Company, and without increasing or creating any liability of said Boston & Albany Railroad Company; and hereby agrees to pay all reasonable expenses, including counsel fees, incurred by said Boston & Albany Railroad Company in defending or resisting any such claim or liability of or against it under said agreement or agreements, or in regard to or in connection with said lands or flats, except as aforesaid, and to pay or indemnify it against all taxes and assessments assessed after the seventh day of February, A. D. 1879, on said lands or flats, or any part thereof.

In witness whereof, said Boston & Albany Railroad Company, and said New York and New England Railroad Company, each by its respective President, thereto duly authorized, has hereto signed its corporate name and set its com-

mon seal, on this fifteenth day of July, in the year eighteen hundred and eighty.

THE BOSTON & ALBANY R. R. CO.,

By WM. BLISS, *President*. [CORPORATE SEAL.]

NEW YORK & NEW ENGLAND RAILROAD CO.,

By WM. T. HART, *President*. [CORPORATE SEAL.]

Signed, sealed and delivered in presence of

CHAS. F. WALCOTT,

To execution by B. & A. R. R. Co.

G. W. BALDWIN,

To execution by N. Y. & N. E. R. R. Co.

[3.]

[See page 4 of Report, *ante*.]CONTRACT OF THE COMMONWEALTH WITH THE
NEW ENGLAND DREDGING COMPANY.

Articles of Agreement, made this first day of July, in the year eighteen hundred and eighty-two, by and between the New England Dredging Company, a corporation established under the laws of Massachusetts, party of the first part, and the Commonwealth of Massachusetts, acting by its Board of Harbor and Land Commissioners, party of the second part.

Said party of the first part hereby covenants and agrees to furnish all the plant, tools, appliances and labor necessary to receive, store, elevate and deposit, as hereinafter provided, all the material, except rocks, stones and sewage matter, dredged in and about Boston Harbor, for which a dumping-ground is desired, or may be assigned by the Board of Harbor and Land Commissioners.

Said party of the first part may locate the dumping-ground and elevating station for said material, between the elevating station now used by said party in executing its contract with said party of the second part, dated August twelfth (12th), eighteen hundred and eighty-one (1881), and the bulkhead extending northerly from the southerly line of Eastern Avenue on a line parallel with and fifty feet east of the easterly line of C Street extended, or in any other location approved by said Board of Harbor and Land Commissioners; and the same shall be of sufficient capacity to accommodate and dispose of all the material offered.

The approach to said dumping-ground shall be kept free and easy of access for scows and tow-boats to bring material thereto at or near high water, and, should it be necessary to excavate a channel for that purpose, the said Board of Harbor and Land Commissioners may require, and by their engineer direct, the party of the first part to dredge the same, the material so dredged to be deposited in accordance

with, and accepted as part performance of, the aforesaid contract dated August twelfth (12th), eighteen hundred and eighty-one (1881), and the channel so excavated, and the necessary space excavated around the elevating station, to be refilled, upon the expiration of this contract, or the abandonment of said station before that time, to its present level, by said party of the second part.

The two elevating stations aforesaid shall be separated by a substantial bulkhead, to be built by said party of the first part, of such dimensions and construction as shall be approved by the engineer of said Board of Harbor and Land Commissioners.

All the material offered as aforesaid shall be elevated, conveyed and deposited, between the present surface and grade thirteen (13), on the area lying between the southerly boundary of the area to be filled by said party of the first part under the aforesaid contract dated August twelfth (12th), eighteen hundred and eighty-one (1881), and the southerly line of Cipher Street, so called, and between B Street and a line one hundred feet east of and parallel with D Street extended, in such places and in such order, working from said B Street easterly, as is consistent with a systematic and practicable arrangement of tramways, to be constructed by said party of the first part for that purpose; but said party of the second part reserves the right to fill, or cause to be filled by other parties, a strip along the southerly side of said area, not exceeding three hundred feet in width, without prejudice to the right of said party of the first part to be paid for material deposited under this contract and flowing upon said strip.

In all work under this contract, the lines, grades and instructions, not inconsistent with the provisions hereof, of the engineer of said Board of Harbor and Land Commissioners, shall be strictly observed, and all necessary aid and materials for giving and indicating said lines and grades, shall be furnished by said party of the first part.

All the work aforesaid shall be done to the reasonable satisfaction of said engineer, from time to time, during the progress and until the completion and acceptance of said work. The material deposited shall be left smooth and

level at grade thirteen (13), except in such places as may be only partially filled at the expiration of this contract, and, where the boundaries are unprotected, the filling may take its natural slope.

Said party of the second part hereby covenants and agrees to pay said party of the first part, for the work aforesaid, at the rate of twenty-five cents for each cubic yard, as measured in the fill, of material received, stored, elevated and deposited as aforesaid.

Monthly estimates of the work done shall be made by the engineer in charge, and monthly payments made of seventy-five per cent. of the contract price for all such material above grade thirteen (13), and ninety per cent. of the contract price for all such material below grade thirteen (13).

When an area has been graded level at grade thirteen (13), or at such grade as shall be thought necessary to allow for settling to said grade, payment shall be made of ninety per cent. of the contract price for all such material on said area up to grade thirteen (13), the remaining ten per cent. to be retained until the final completion and acceptance of the work, or the expiration of this contract.

When the area filled from one tramway has been levelled and maintained at grade thirteen (13) for one month, such area shall be accepted as to grade, and the contractor relieved of further responsibility for the same.

Upon all questions of measurements, lines or grades, proposed in writing by one party, the decision of the engineer of said Board, after notice to the other party, shall be final.

This agreement shall expire on the eighteenth (18th) day of August, eighteen hundred and eighty-four (1884), and, if said party of the first part shall refuse or neglect to prosecute the work herein contracted for, or in any other substantial respect shall violate or fail to carry out this agreement, said party of the second part may at any time annul the same, and contract anew with other parties, without prejudice to its claim for damages arising from breach hereof.

IN WITNESS WHEREOF, the said New England Dredging Company has caused its corporate seal to be hereto affixed, and these presents to be signed and delivered, in its name and behalf, by Charles H. Souther, its President and Treas-

urer, and the said Commonwealth has caused its seal to be hereto affixed, and these presents to be signed and delivered, in its name and behalf, by its Board of Harbor and Land Commissioners, the day and year first above written, and the same to be approved by its Governor and Council.

NEW ENGLAND DREDGING COMPANY,

BY CHARLES H. SOUTHER, [SEAL OF NEW ENGLAND
DREDGING CO.]
President and Treasurer.

THE COMMONWEALTH OF MASSACHUSETTS,

BY JOHN E. SANFORD, } *Harbor and*
FRANCIS A. NYE, } *Land*
HENRY L. WHITING, } *Commissioners.* [SEAL OF THE
COMMONWEALTH.]

Executed in presence of

D. KOPPMANN,

Witness to all the signatures.

In Council, August 15, 1882. Approved.

HENRY B. PEIRCE, *Secretary.*

[4.]

[See page 4 of Report, *ante.*]CONTRACT OF THE COMMONWEALTH WITH STEPHEN
JENNEY & COMPANY.

This Indenture, made this first day of July, 1882, by and between the Commonwealth of Massachusetts, party of the first part, and Bernard Jenney and Francis H. Jenney, co-partners, doing business under the name of Stephen Jenney & Company, parties of the second part, witnesseth: —

Said party of the first part covenants and agrees that it will not, for the term of three years from the day of the date hereof, hinder or obstruct the access of said parties of the second part, their heirs and assigns, to their wharf, situate at South Boston, and known as Jenney's Wharf, by any filling or deposit made, or structure built, or other thing done by it, or under its license or authority, between said wharf and a line indicated by the red line A B C on the plan* hereto annexed and made a part hereof; nor, in any manner as aforesaid, during said term, cut off the approach to said wharf, from the main harbor of the City of Boston, by some channel or course having as deep water as the present channel or course affords.

Said party of the first part doth also hereby lease, demise and let unto said parties of the second part, to have and to hold to them, their heirs and assigns, for the term aforesaid, a certain rectangular parcel of land or flats, lying adjacent to their wharf aforesaid, and indicated on said annexed plan* by the letters D E F and G, placed in red ink at the several corners thereof; together with all the right, title and interest which said party of the first part hath in and to so much of the street laid out or projected, and called E Street, as lies between said parcel and Monks Wharf, and between the lines E F and D G, on said plan, extended.

* The plan referred to is on file in the offices of the Secretary and the Treasurer of the Commonwealth, and of this Board.

In consideration of the foregoing, said parties of the second part, for themselves, their heirs, executors, administrators and assigns, covenant and agree to pay to said party of the first part, the sum of six hundred and fifty dollars (\$650) each year during the term aforesaid, in equal semi-annual instalments of three hundred and twenty-five dollars (\$325) each, payable on the first days of January and July, the first payment to be made on the first day of January, 1883.

IN TESTIMONY WHEREOF, the said party of the first part, by its Board of Harbor and Land Commissioners, has caused these presents to be executed in its name and behalf, and its seal to be hereto affixed, and the same to be approved by its Governor and Council; and the said parties of the second part have hereunto set their hands and seals, the day and year first above written.

COMMONWEALTH OF MASSACHUSETTS,

By JOHN E. SANFORD,	} <i>Harbor and</i>	(SEAL OF THE COMMONWEALTH.)	
FRANCIS A. NYE,			<i>Land</i>
HENRY L. WHITING,			<i>Commissioners.</i>

BERNARD JENNEY. (SEAL.)

FRANCIS H. JENNEY. (SEAL.)

Signed, sealed and delivered in presence of

D. KOPPMANN, *Witness to all Parties.*

In Council, August 15, 1882. Approved.

HENRY B. PEIRCE, *Secretary.*

[5.]

[See page 4 of Report, *ante*.]CONTRACT OF THE COMMONWEALTH WITH THE
TRUSTEES UNDER THE WILL OF JOHN P. MONKS.

This Indenture, made this first day of July, 1882, by and between the Commonwealth of Massachusetts, party of the first part, and Richard J. Monks and Frank H. Monks, trustees under the will of John P. Monks, parties of the second part, witnesseth : —

Said party of the first part covenants and agrees that it will not, for the term of three years from the day of the date hereof, hinder or obstruct the access of said parties of the second part, their successors and assigns, to their wharf, situate at South Boston, and known as Monks Wharf, by any filling or deposit made, or structure built, or other thing done by it, or under its license or authority, between said wharf and a line indicated by the red line A B C on the plan* hereunto annexed and made a part hereof ; nor, in any manner as aforesaid, during said term, cut off the approach to said wharf, from the main harbor of the City of Boston, by some channel or course having as deep water as the present channel or course affords.

In consideration thereof, said parties of the second part, for themselves, their successors and assigns, covenant and agree to pay to said party of the first part, the sum of three hundred and fifty dollars (\$350) each year during the term aforesaid, in equal semi-annual instalments of one hundred and seventy-five dollars (\$175) each, payable on the first days of January and July, the first payment to be made on the first day of January, 1883.

IN WITNESS WHEREOF, the said party of the first part, by its Board of Harbor and Land Commissioners, has caused these presents to be executed in its name and behalf, and its seal

* The plan referred to is on file in the offices of the Secretary and the Treasurer of the Commonwealth, and of this Board.

to be hereto affixed, and the same to be approved by its Governor and Council; and the said parties of the second part have hereunto set their hands and seals, the day and year first above written.

COMMONWEALTH OF MASSACHUSETTS,

By JOHN E. SANFORD, } *Harbor and*
FRANCIS A. NYE, } *Land* (SEAL OF THE
HENRY L. WHITING, } *Commissioners.* COMMONWEALTH.)

RICHARD J. MONKS, } *Trustees.* (SEAL.)
FRANK H. MONKS, } (SEAL.)

Signed, sealed and delivered in presence of

D. KOPPMANN, *Witness to all Parties.*

In Council, August 15, 1882. Approved.

HENRY B. PEIRCE, *Secretary.*

[6.]

[See page 3 of Report, *ante*.]SUPPLEMENTARY CONTRACT OF THE COMMON-
WEALTH WITH THOMAS POTTER.

Supplementary Agreement, made this twenty-sixth day of December, 1882, by and between Thomas Potter, party of the first part, and the Commonwealth of Massachusetts, party of the second part.

Whereas, the said parties, on the 28th day of August, 1880, entered into an agreement in writing, which is referred to and made a part hereof as if fully recited herein, whereby the said Potter, upon the terms and conditions in said agreement set forth, agreed to do certain dredging in Boston Harbor and, with the material so dredged, to fill certain flats of said Commonwealth at South Boston ;

And whereas, it was stipulated in said agreement that the aforesaid dredging and filling should be completed by said Potter on or before the first day of January, 1883 ;

And whereas, the said Potter will be unable to complete said work on or before said first day of January, 1883, and desires an extension of time for completing the same :

Now, therefore, it is agreed by the parties hereto, that the time for executing and completing the work stipulated to be done by the said Potter in the agreement aforesaid, shall be, and is hereby, extended one year from and after said first day of January, 1883.

It is also agreed that said Commonwealth may, by its Board of Harbor and Land Commissioners, and in their discretion, appoint from time to time a suitable person as inspector, who shall have supervision, subject to the direction and control of the engineer of said Board, of the place and depth of the dredging to be done by said Potter under said original agreement ; and the compensation of such inspector, at a reasonable and ordinary rate for such service, shall be paid by said Potter, by deducting the same from the pay-

ments which may be due him from time to time under said agreement.

All the provisions of said original agreement of August 28th, 1880, regarding rate of compensation per cubic yard, and otherwise, shall be and remain in full binding force upon the parties hereto, except so far as expressly modified by the provisions of this agreement as aforesaid.

IN TESTIMONY WHEREOF, the said Thomas Potter has hereunto set his hand and seal, and the said Commonwealth has caused its seal to be hereto affixed, and these presents to be signed and delivered, in its name and behalf, by its Board of Harbor and Land Commissioners, the day and year first above written, and the same to be approved by its Governor and Council.

THOMAS POTTER.

[SEAL.]

COMMONWEALTH OF MASSACHUSETTS,

By JOHN E. SANFORD, } *Harbor and*
FRANCIS A. NYE, } *Land*
HENRY L. WHITING, } *Commissioners.* [SEAL OF THE
COMMONWEALTH.]

COMMONWEALTH OF MASSACHUSETTS.

BOSTON, January 1, 1883.

Approved by the Governor and Council.

HENRY B. PEIRCE,
Secretary of the Commonwealth.

[7.]

[See page 40 of Report, *ante*.]

UNITED STATES ENGINEER OFFICE,

WAREHAM, MASS., December 18, 1882.

To the Hon. the Board of Harbor and Land Commissioners.

GENTLEMEN, — In reply to your request of the 14th inst., I have to state that it is only since September last that I have been charged with river and harbor improvements under the general government within the limits of your Commonwealth, and consequently there is little to be said upon the subject in addition to the data you have probably already before you.

At the above mentioned date, I took charge of the harbors of Hyannis and Wareham, vacated by the death of the late General Warren, and subsequently relieved General Thom of the charge of the harbors of Scituate, Plymouth and Provincetown. Although but little has been done within the limited period I have had charge of these works, I am happy to furnish you with the information I understand you to desire even as regards that little, and as follows.

Hyannis.

This is a completed harbor, the charge consisting in seeing that the stone breakwater protecting the anchorage is kept in repair.

General Warren, in his last annual report, suggests improvement of the channel of entrance by dredging. I shall examine into the matter and follow it up in my next annual report.

Wareham.

The improvement is designed to afford a commodious channel from Buzzard's Bay to the town front, through which vessels drawing thirteen feet can sail at high tide. This involves the expenditure of about \$30,000 in dredging, which can only be done advantageously in bulk, and con-

sequently the small appropriation of \$5,000, made at the last session of Congress, is now being expended upon catch-sand fencing on Long Beach, a sand spit which is encroaching on the navigable channel.

By aid of this \$5,000, within a month or so I shall have this sand spit thoroughly under my control, arresting all further channel encroachment, and raising the beach beyond flood-tide level, ready to be planted with beach grass in 1883, which measure will fully complete the desired improvement as far as this beach is concerned, all further operations being simply designed to widen the beach, and to place it in such condition as to be beyond danger of incommoding the channel hereafter.

The work of securing this beach is being done by building brush fences, of alternate layers of scrub-pine trees and stone, to a height of three feet. These catch the sand, but are soon enveloped with it, the practical result, however, being to raise the beach to the height of their crest, and to the width between the fences. General Warren's work has resulted in bringing up the beach to high-tide level. I am now building a frame barrier, 1,000 feet long, on the basis of his work, by which I expect to bring the crest of the beach at least two feet above flood-tide level, and, when it is planted with beach grass, the improvement will be permanently secured.

The prime necessity of this harbor now is an appropriation of at least \$10,000, to enable the channel improvement, by dredging, to be undertaken. A less amount than \$10,000 is inadequate even to begin the work.

Scituate, Plymouth and Provincetown.

For your fuller information with regard to the stage of improvement of these harbors, I have the pleasure to mail you herewith a marked copy of the annual report of General Thom, which carries the history of the several improvements as far as June, 1882. I have only to add, with regard to

Scituate,

That the contractor is now vigorously prosecuting his contract, in connecting the last year's work with the shore line above high tide, at the old Cedar Point lighthouse.

Plymouth.

The contractor has placed 1,888 tons of stone upon the shore protection at the inner end of Long Beach, and has nearly connected the enrockment with the main land at the point I have indicated to him. This improvement will permanently hold the end of the beach, but will not protect the adjacent channel to Plymouth wharves from encroachment by the sand carried from the beach into the channel through the enrockment by undertow. Consequently, in my next annual report, I shall estimate to secure this beach in a manner, not only to take care of the beach itself, but to prevent damage to the channel.

Provincetown.

Here the preservation of Long Point only is in question at present, although the whole peninsula, from Truro, both on the Atlantic and Massachusetts Bay side, needs watching. I shall patrol it personally before making my next annual report. At Long Point, the beach protection (enrockment) should have been continued this year to high-water line, and thence an apron of granite blocks should be carried at least a hundred feet along the beach. On assuming charge of these works, I tried to have this done at once, but I was unable to find contractors or men who would undertake it, to carry it out completely, so late in the year. As the incomplete work would damage the beach more than it would do it good, I have given the matter over until next spring, and will have it under contract by that time.

In conclusion, I beg leave to state that I am glad to have received your letter of the 14th inst., as I recognize the fact that the interests of the United States and the Commonwealth are identical in these matters, and can best be subserved by free communication between their several agents. Accordingly, I am always at the service of your honorable body, as far as our several duties concur, and have the honor to be,

Very respectfully,

F. HARWOOD,
Major of Engineers.

[8.]

[See page 26 of Report, *ante.*]

COMMONWEALTH OF MASSACHUSETTS.

In the year one thousand eight hundred and eighty-three.

AN ACT to define the Boundary Line of Tide Water between the State of Massachusetts and the State of Rhode Island and Providence Plantations.

Be it enacted, etc.:

SECTION 1. The boundary line of tide water between the State of Massachusetts and the State of Rhode Island and Providence Plantations, is hereby located and defined as follows: Beginning at the southerly end of the boundary line of land between the said States, as the same is now established by law, and thence running southerly, in a course across and at right angles with the shore line, (which is a line drawn from the headland at Gooseberry Neck, in the former State, to the headland at Warren's Point, in the latter State,) to a point in latitude $41^{\circ} 25' 05''$, longitude $71^{\circ} 05' 28''$, and distant one marine league, southerly, from the said shore line.

SECTION 2. This act shall take effect when the said boundary line, as herein located and defined, has been approved and established by the General Assembly of the State of Rhode Island and Providence Plantations.